FACT

The Magazine of Fertilisers And Chemicals, Travancore Ltd.
Vol. 5. No. 3. September 1950.

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

An Experimental Farm in Britain. Soil Survey is done here by the British Agricultural Research Council.

FACT Vol. 5. No. 3. Pp. 59 to 86 Alwaye, September 1950.

U. S. A. International Trade Fair Held at Chicago between 7-20 August last.

FACT

Vol. 5 No. 3
September 1950

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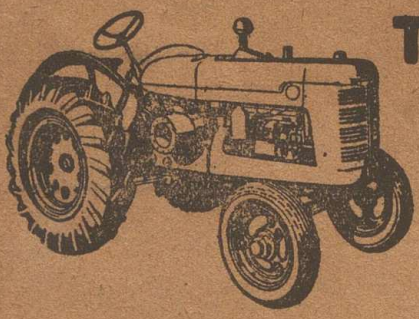
Books and Pamphlets on scientific, industrial and allied themes are accepted for review in this Journal.

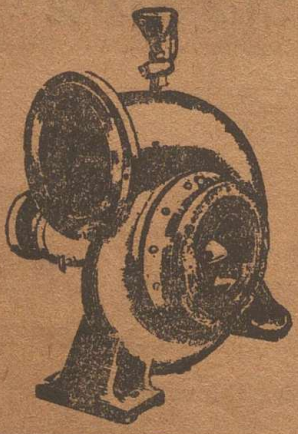
Editor

In this Issue.....



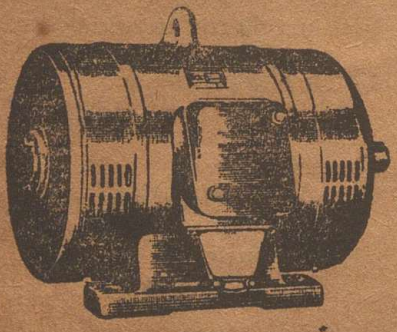
TRACTORS

and implements for all agricultural operations, even for small farms. Tractors with belt pulley are a source of stationary power for pumping, chaff-cutting, threshing.



PUMPS

for irrigation and other purposes.



MOTORS

for all purposes in a wide range of horse-power.

VOLKART

VOLKART BROTHERS

P. O. Box 3, Calvetty Road, Cochin.

VOL. 5 | SEPTEMBER 1950 | NO. 3

EDITORIAL.

FERTILISER PRODUCTION

SOME months ago a band of Fertiliser experts of the United Kingdom, went out on deputation to the U. S. A., to study at first hand the production methods of Fertiliser manufacturers of that country. This "Productivity Team" have made their report after an extended tour of American Fertiliser factories, conducted under the auspices of the Anglo American Council on Productivity.

It appears that there are quite a few fundamental differences between the industry in Britain and that in U. S. A. In America there is ample supply of sulphur for acid manufacture, and the standard of water-soluble phosphoric acid content in fertilisers is not too exacting. These factors are a great advantage to the superphosphate manufacturers there, and they have been able to forge ahead of the rest of the world in consequence. Over and above this, the availability of unlimited land and building materials at a cheap rate, have enabled manufacturers over there to erect their factories in straight line single blocks, which is an added advantage, in that it brings down supervision and transporting costs.

Another feature on which the report comments with approbation is the fact that in America it has been made possible to establish agricultural research stations, in every state, in close collaboration with the Fertiliser Industry. In addition to this, advisory services on a large scale have also been set up, to educate the farmer in the correct and adequate use of fertilisers, to improve crop yields and the soil fertility generally.

To minimise storage space, and to reduce the cost of freight over vast areas, great attention has been bestowed in the manufacture of new types of fertilisers with increased plant food content. These are known as "concentrated fertilisers" and their production, the report says, has progressed much faster in America than in Britain. Thus the average plant food content in the commercial fertiliser has been raised from 18 p. c. upto 28 p. c. in some cases. It has been estimated that this increase has enabled the American farmer to effect a saving of about 5 million dollars per year in freight charges alone.

There is no doubt that the findings of this "Productivity Team" are of very great interest to fertiliser manufacturers in India. The industry here is still in the stage of infancy and more or less disorganised, but when considering the demands that may be made of it in the immediate future and the scope for its expansion in full measure in view of the Government's food policy, it is very vital for us to go carefully into the details of the experiences of fertiliser manufacturers elsewhere, and to take careful stock of them for proper guidance and fruitful planning. It may not therefore be out of place if we quote *in extenso*, a few of the recommendations, both general and technical made by the team. They are of course intended in the first instance, for improving the tone and set-up of the British Fertiliser Industry, but, with a few minor alterations to suit local conditions, they may be adopted with profit in this country also. The experts recommend:-

1. A national survey of soil fertility.
2. Adoption of the available phosphoric acid standard for fertilisers in preference to the water soluable standard as soon as possible.
3. An expansion of free exchange of all information designed to increase productivity within the industry.
4. Propaganda to encourage the correct and wider use of fertilisers.
5. Continued restriction in the interests of production and economy, of the number of different mixtures produced.
6. Investigation of the possibility of bulk distribution and spreading of granular fertiliser in one operation.
7. Investigation by the railway authorities of the possibility of increased provision of bottom discharge wagons, in view of the rapidly increasing quantities of bulk material transported by rail.
8. Centralisation of controls in new or reconstructed acid plants to economise man-power.
9. The use of simple mechanical devices, such as drag line scrapers, for the rapid discharge of bulk material from railway wagon and of mechanical handling equipment to reduce human effort.
10. The supplementing of safety measures by propaganda to make workers safety conscious.

It is refreshing to note in this connection, that the Heavy Chemicals Committee of the I. S. I. which met at Bombay, and the Superphosphate Manufacturers' Association which held a session recently at Hyderabad, have also discussed some of the foregoing ideas for adoption. And it is our devout hope that the Fertiliser manufacturers in India will lose no time in accepting and incorporating them into their development schemes.

RAYON INDUSTRY

By
A. R. RAMANATHAN,
Director, The Travancore Rayons Limited.

FROM the twilight of world history, the clothing medium has been constantly exercising the minds of humanity. We have fast progressed from the aboriginal apparels of leaves, grasses, hides and skins, to the panorama of the modern textile fibres. Yet more! The ever active mind of man and the ceaseless search of science have brought about a revolutionary sensation in the textile field by the discovery of synthetic fibres which equal, if not surpass, the best natural fibres in beauty, durability and cost. Of the man-made fibres, Rayon occupies the first place. Rayon was born only just about fifty years ago, but its development has been so rapid during this short span that today we are able to obtain rayon fibre superior to the natural fibres in certain respects and possessing certain properties of great textile significance, which cotton or silk do not possess. Next to cotton, rayon is the most widely used fibre in the world now. The total world production of rayon yarn has increased from 18.7 million lbs. in 1911 to 1,447 million lbs. in 1942 and to 2,155 million lbs. in 1944 as evidenced by the accompanying statement.

Though no authentic statistics could be given here regarding the post-war production of the fibre, it is clear that the postwar period is witnessing revival of production of the rayon yarn on a far larger scale, alongside the steadily mounting demand. Such production gallop, as above, is proof positive of the enormous popularity which this man-made fibre has won. It is reported that in the West, rayon has not only been able to give a good fight to cotton and natural silk, it has even been able to replace them to a high degree in certain countries, while in some others, more than 50% of the clothing is made out of Rayon. Besides other factors, the versatility of rayon has gained astounding importance for it. It offers the widest variety of pattern, weave, colour, range, design and quality at prices which will suit all income groups. If the present pace of progress is maintained, one need hardly wonder if rayon and its family soon consign the comparatively stagnant natural fibres to their limbo of oblivion!

It is perhaps ironical that on the face of such phenomenal progress which the fibre has achieved in the rest of the world, rayon yarn production has remained unknown all along in India. Thanks to the advent of a National Government, keenly alive to the rapid industrialization of the country, attempts are now afoot to put India on the rayon map. It is claimed that, to begin with, India is to have four Rayon Factories. The first one, The Travancore Rayons Ltd., Perumbavoor, State of Travancore & Cochin, has already begun manufacturing viscose transparent cellulose paper and will begin spinning rayon in the course of the next few months. India being well placed in regard to the cellulosic materials, heavy chemicals, abundant water supply, hydro-electric power, cheap and intelligent labour, the Indian Rayon Industry may reasonably hope for a good beginning and bright

prospects. Indeed, at the present juncture, with inadequate production of cotton cloth, with an ever-growing population and the consequent increase in demand, rayon textiles will but be received with great eclat as a means of over-whelming relief.

It would perhaps be interesting here to take the reader through a nut-shell description of the manufacture of the fibre. Wood pulp, in sheet form, is steeped in Caustic Soda solution for alkali cellulose. The alkali cellulose sheets are then thoroughly agitated and shredded into crumbs and the crumbs are allowed to mature about 48 to 72 hours. After maturing, they are treated with carbon-di-sulphide, forming sodium cellulose Xanthate. The sodium Xanthate is then again dissolved in caustic soda, the resultant solution being viscose. The viscose is allowed to ripen for about 2 to 3 days, and then pumped through fine jets or spinnerettes into a coagulated acid bath, when the viscose is regenerated into fine filaments of yarn.

As could be followed from the above, though rayon is a textile, the rayon industry is essentially a chemical industry, highly technical and rather complicated. Rayon is extremely sensitive about fine grade caustic soda (of 99 percent purity), copious supply of pure and soft water, and wellcontrolled air conditioning. The important subsidiary aspects in the industry are those of the manufacture of CS_2, manufacture of conditioned air, water treatment, power generation, steam raising, effluent disposal etc.

The setting up of the numerous plants necessary for the above primary and subsidiary purposes, the setting up of the buildings needed to house such plants and the setting up of the efficient man-power to handle the plants and processing with precision and confidence, are all matters involving huge capital resources, rich scientific and technical skill, thorough planning and high organisational ability. None of these are wanting in India, indeed India is far superior to many other countries of the world in every one of these respects, and with an enlightened, responsive and truly national Government as its sheet anchor, is it too much to hope that it will not be long! before this lustrous fibre becomes a potent force in the Indian Industrial and Economic fronts?

PRODUCTION OF CONTINUOUS FILAMENT RAYON IN WORLD AND IN SELECTED COUNTRIES 1911—1942.

Year	United States	Japan	Germany	Italy	Great Britain	France	Others	World total
	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds
1911	.4	.....	*	*	*	2.6	15.7	18 7
1913	1.8	.....	7.7	.3	6.6	3.3	5.5	25.2
1920	10.1	.2	5.2	1.6	6.0	3.4	6.6	33.1
1925	51.0	3.2	26.0	30.8	29.8	14.3	30.2	185.3
1930	127.3	36.6	59.0	66.3	47.0	50.6	64.4	451.2
1935	257.6	224.3	97.7	85.7	112.2	61.5	102.1	941.1
1940	390.1	225.0	250.0	100.0	100.0	...	78.96	1,144.0
1942	479.3	300.0	220.0	132.0	90.0	69.5	156.4	1,447.2

* Separate data not available. Production if any included under "other".

We Can Grow Clean Crops

By
Dr. E. HOLMES

IT has been, and is being, drilled into us, almost *ad nauseum*, that the world's population is growing at a far faster rate than our present efforts to feed it adequately. Nearer home it is manifestly imperative for Britain to grow a far greater share of the food it eats than has been customary or necessary in the past 70 or 80 years. To this end, the individual farmer is being exhorted to produce more and better crops from his particular holding, despite labour shortages and higher costs for his purchases.

It is not for me to go into the question of bringing greater areas under cultivation or increasing yields by the use of better crop species and larger quantities of fertilizers. But I would draw attention to the fact that in his recent paper to the Farmer's Club on cropping targets, Sir James Scott Watson dealt particularly with the maintenance of soil fertility as a prerequisite for the success of the Agricultural Expansion Programme.

He went on to interpret soil fertility as something wider than the traditional description of land as "clean and in good heart." In dealing with clean land he discussed the questions of control of soil pests, soil-borne diseases and weeds. I propose to go a stage further.

LARGER AND BETTER.

My concern is crop protection; that is the production of larger and better quality crops by the prevention of loss and damage due to insect pests and fungus diseases, below and above ground level, and by the prevention of competition due to weeds growing in crops—in other words the growing of "clean crops."

There is no doubt that adequate attention to these measures would increase yields of a large proportion of our acreage by at least 10 to 20 per cent. In addition many of these measures save labour, as will appear when we look into these different problems in a little more detail.

Cereals occupy by far the larger part of our arable acreage and, on a considerable proportion of them, particularly but not exclusively in the south-eastern portion of England, wireworms are a recurrent menace. They are, of course, worst on newly ploughed pasture, but can be serious even in old arable land.

It is only since the discovery in 1942-43 that benzene hexachloride (BHC) and particularly its gamma isomer are remarkable insecticides and, subsequently, that they are really out-standing soil insecticides that effective control of wireworm damage has been achieved. It is now possible to obtain complete protection of cereal crops from serious wireworm attack by broadcast treatment with dusts just before sowing, whilst the latest seed-dressing method is even simpler and cheaper.

Costs are about 60s per acre plus a small charge for application for broad-cast treatment, 20s to 30s, again plus cost of application, for the combine method, whilst the seed dressing costs only about 12s per acre. The last includes the benefit of disease control and no extra cost of application, assuming the farmer has decided to sow dressed seed anyway.

FOR SUGAR BEET.

It may be remarked at this point that similar seed dressings are being developed specially for use on sugar beet with its low seeding rate. These should increase stands of beet seedlings, even in the presence of wireworm, and simplify thinning problems.

Control of turnip fly is another operation that has benefited from recent research. It is true that derris dusts did a reasonable job ten or twenty years ago, but the more persistent dusts based on DDT and BHC have proved more efficient and rendered the practice very much more wide-spread. The cost of a single treatment, assuming row application, is of the order of 12s per acre and one or two treatments are usually adequate even in a bad "fly" year.

In both cases so far mentioned control of wireworms and turnip fly by means of a simple application procedure has, on balance, frequently saved labour as compared with ploughing up, preparing a new seed bed and reseeding.

THE COMPLETE ANSWER.

On the fungus side, control of stinking smut or bunt of wheat, leaf stripe of oats, net blotch of barley and many other seed-borne diseases is too well-known to need detailed comment in this article.

Application of any good organo-mercury dressing at about 2oz. per bushel is the complete answer and the cost only a shilling or so per acre.

On the other hand it is estimated that not much more than half the total cereal seedsown in Britain is so treated. Surely this is a mistake when insurance against loss of quality in wheat or loss of stand in oats may be bought so cheaply.

For most of the past decade the bulk of the flax in Britain has been dressed with a special seed dressing for the control of seedling blight and browning disease. Just recently, a new dressing for the treatment of pea seed has been introduced which, in widespread trials, has given some remarkable results in increased stands and ultimate yields.

So far I have dealt only with farm crops. Equally great advances have been made in the control of insect pests and fungus diseases of fruit and hops, market garden crops grown in glasshouses. DDT has largely replaced lead arsenate for caterpillar control and it has given excellent results against fruit tree capsids. The new phosphorus insecticides, TEPP and parathion, although dangerous poisons to be treated with great respect, have supplemented nicotine for aphis control and promise to revolutionize the handling of the red spider problem.

The latest of this series has really put systemic insecticides on the map, although selenium has been known as a systemic for over twenty years.

NEW TECHNIQUE.

A new technique of application deserves special mention. I refer to the smoke generator method of applying insecticides in glasshouses. Generators are now available, based on pyrotechnic mixtures containing DDT, BCH, azobenzene and parathisn, which on simple ignition give off smoke toxic to aphids, caterpillars, white fly, thrips, leaf miners, red spider and several other noxious pests. It appears only a matter of time before similar fungicide generators come along.

Turning now to selective weedkillers, we already have a reasonable armoury of chemical weapons to fight a wide range of weeds growing in crops. In addition to the rather spectacular, so called hormone weedkillers such as MCPA and 2, 4-D which control the charlocks, fat hen, pennycress, thistles, and many other weeds in cereals, we have DNC compositions which are specially valuable against cleavers and corn marigold, DNSBP (dinitro secondary butyl-phenol) which shows promise against weeds in lucerne and peas, special petroleum fractions for weeds in carrots and, of course, sulphuric acid still the best killer of potato haulms as a preliminary to lifting.

It has recently been estimated that yields of cereals can be increased, where weeds are fairly serious, by at least 20 per cent. In some cases much greater increases have been recorded, but over the whole cereal acreage Professor Blackman estimates that a general increase of 10 per cent should be possible.

Sir James Scott Watson, in the paper already mentioned, drew attention to the fact that in the old days root crops generally, and even cereals in many areas, were meticulously hand-weeded. Wages were then such as to allow that practice; today it would be quite impossible, but chemical weedkillers do the job just as efficiently and cut out the heavy labour requirements.

IN PASTURE.

Hitherto, we have heard so much less about weeds in pasture that the subject deserves special mention. It is now well established that such grassland weeds as creeping buttercup, thistles, dandelion, seedling and curly leafed docks and rushes, may be practically exterminated by the use of 2 to 4 lb. per acre of the active principles MCPA or 2, 4-D. MCPA happens to be much more efficient than 2, 4-D against creeping buttercup, but neither is much good against the bulbous variety. Thistles are best treated when they are about three-parts grown and may need two applications in successive seasons for complete suppression. Mature, broad-leafed docks are very resistant and are not worth treatment, Rushes, on the other hand, are very suceptible even to the lower rate of application, especially if they are mown first.

CAPITAL INVESTMENT PROGRESS

How Wise Expenditure Has Transformed A Nation's Industry

By
R. W. THOMPSON

CAPITAL investment, which for all countries means re-building, re-equipment, maintenance and development, is the foundation upon which economic strength is built. It may be described as "the tools" without which industry can neither grow nor flourish, and lacking its helping hand even the fertility of the soil is difficult to maintain.

Since World War II ended about 20 per cent of Britain's national income, representing a total sum of at least £10,000 millions, has been expended each year on the labour and materials without which even partial recovery from wartime sacrifices and consequences would have been impossible. It has been little enough. So much had to be done and so much is still required. In 1950 Britain finds it necessary to curb expenditure while maintaining a steady expansion of production; sums it was hoped to spend on road building and housing have had to be pared down to maintain the vital flow of development in the industrial field. This alone reflects the extreme urgency and the difficulty of the task. Neverthless real progress has been made and Britain stands transformed from the war-shattered and impoverished nation of 1945 so that she is once again a great modern workshop of the world.

EXPORTS 50 PER CENT UP

Britain now has an industrial output which has enabled her to increase exports 50 per cent above 1938, and at the same time to maintain and improve the health, educational and social services of the people. In 1945, arrears of maintenance and war damage were estimated at over £3,000 million and it was planned to devote the resources available in the following proportions:

Fuel and Power	15%.
Transport & Communications	18%.
Agriculture	6%.
Industry (including ships)	33%.
Housing	16%.
Social services	7%.
Defence and Public Administration	5%.

Thus 72 per cent of the total had to be concentrated on production, and the dividends this policy has paid are now apparent to any visitor to the British Industries Fair, that great annual show of the main products of United Kingdom Industries, which this year opened on May 8.

Five years ago the position of the coal mining industry in Britain was not a happy one. Many mines were uneconomic, some almost derelict, or inadequately mechanised. By the end of 1947, 52 major capital schemes had been approved, and many of these are now in existence. New sinkings are now coming into production; the reorganisation of underground haulage using the latest type of diesel and electric locomotives had made great progress, while the installation of surface cleaning

plant and the improvement and extension of mechanisation steadily increases output and quality. In the result coal production has not only been maintained but increased from the 186 million tons of 1945 to the 215 million tons of 1949.

NEW GENERATING STATIONS

Side by side with the reconstruction of the coal industry, a vast programme of electrical power development has been making steady headway. By 1947, 57 new generating stations and extensions were planned or in the course of construction, and an ambitious scheme to hardness the power of some of the Scottish lochs was begun. To-day the waters from Loch Sloy are generating power for Scottish industry, and with the completion of such plants as the new Cliff Quay Power Station at Ipswich in Suffolk, two million kilowatts has been added to generating capacity. And there are still 38 new power stations under construction.

Despite the importance of fuel and power, little of this construction or the remarkable expansion of the engineering industries could have taken place without iron and steel. Perhaps the most spectacular development in this field, rivalling the giant structures of the new oil refineries, is the massive framework which has risen from the sand dunes of South Wales at Margam, and is destined to become one of the greatest steel-rolling mills in the world. Elsewhere other great iron and steel enterprises are nearing completion, and already the coking ovens at Margam and Scunthorpe, in eastern England, are fired. Five years ago these were little more than blue prints.

1,000 FACTORIES BUILT

It is impossible here to do more than draw attention to the progress in these vital fields, but it is clear that the whole of Britain is affected. Nearly 1,000 new factories have been built in the development areas since the war, and 340 of these were completed in 1949 to bring new strength to the production drive and new heart and prospects of continued employment to the peoples of Tyneside, South Wales and Scotland.

Over a wide range of industry new equipment has speeded up production and improved productivity, while a steady investment in schools, universities, technical colleges and research centres, safeguards the supply of new blood, new thinking and new ability without which the whole edifice would be worthless.

But Britain is an island, and when the war ended 18 million tons of her shipping was at the bottom of the sea. Today the merchant fleet is not only rebuilt, but nearly half the merchant shipping of the world is built or building in United Kingdom yards.

Today in the fields and factories, in the ports, on the roads and in almost every phase of the life of the country there is plenty of evidence of the progress that has been achieved by ploughing back wealth in the form of capital investment.

Soil and Crop Production

By
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THE slogan of the Free India is "Produce more or perish". Today India is facing the worst food crisis possible and the attention of all the leaders has been concentrated on one point how to solve this crisis.

One of the main things to be done is to examine the soil and see how it can be improved to contain the necessary plant nutrients so that we can get increased crop yields. So an attempt is made in the foregoing paragraphs to analyse the relation between the soil and the crop production and see how far the improvement of soil and proper utilisation of the available manure will be helpful in increasing crop production.

Agriculture is the backbone of a country and a country's prosperity is mainly dependent upon its agricultural wealth.

Indian Agriculture consists mainly of the production of crops. They are of three kinds: First in importance are the field crops, second the vegetable crops, and third fruit crops. Of these three, the first is by far the most important in this country, as the area occupied by the field crops is very much greater and the total production is also many times greater than that of the other two. Of the field crops grown in this country, rice occupies by far the largest area.

The character of agriculture of a country is dependent to a large extent on the nature and properties of its soils which are greatly dependent upon the climate of the region in which the soil occurs. In India soils which extend from temperate regions through the sub-tropical and into the torrid zone vary considerably. Hilgard, Ramann and Glinka were among the first to point out that climatic agencies of the locality in which the soil occurs and the parent rock, all jointly are responsible for the formation and distribution of different types of soils.

Soils of India have been investigated from time to time to some extent by the geological survey of India. Four main types of soils have been recognised in India. These four types are: (i) The Indo-gangetic alluvium, (ii) the regur or "Black cotton soils" which overlie the Deccan trap, (iii) the red soils derived from the rocks of the Archaen system found in Madras and Mysore, (iv) the laterite soils which form a belt around the peninsula extending through East Bengal into Assam.

Among the above groups of soils, alluvial soil is by far the most extensive and agriculturally important of all the soil groups in India. The greatest portion of this soil is found in the Indo-gangetic region. Even though these soils contain low nitrogen and phosphorus and potassium, they are characterised by ease of cultivation and rapid response to irrigation and manuring,

"Black cotton soil" which stands next to alluvial soil in importance and covers an area of about 2,00,000 sq. miles and varies greatly in colour, is clayey and calcareous. These soils contain large quantities of clacium, magnesium carbonate, iron, aluminium low nitrogen, potassium and organic matter.

Laterite soils are poor in plant nutrients and low in nitrogen as well as lime, magnesia and potash.

From the view point of agriculture, soil is a medium for crop production. Soil management plays a very important part in agriculture. One of the most common and practical methods which the agriculturist adopts in his management of soil is what is known as tillage. This operation iufluences not only the physical conditions of the soil but also its chemical and biological condition. One of the practical agriculturists of the 18th century made a remark that "Tillage is manure". This term includes such operation as ploughing, harrowing, grubbing or cultivating, planking, hoeing, ridging and furrowing.

Tillage has various advantages, such as loosening the soil for deposition of seeds and helping in absorption of water, aerating sub-soil surface and destruction of disease organisms. In short tillage aids production of suitable physical, chemical and biological soil conditions.

Soil is the storehouse of food materials which are being continually removed by the crop plants. Some of these do not naturally become available as rapidly as they are removed. It is therefore obvious that this continued removal of nutrients will ultimately impoverish the soil unless something is done to replenish the supply. The application of manures and fertilisers is the practical way of keeping up the fertility of the soil.

Manures and fertilisers are classified into four groups, animal manures, green manures, chemical fertilisers and special manures. Animal manure constitutes the solid and liquid portions of animal excreta. Green manure comprise crops grown and ploughed under to increase the organic matter. Chemical fertilisers are inorganic materials applied to the soil to increase the supply of soil nutrients such as nitrogen, phosphorus and potassium. Special manures consist of substances which do not fall into the above three groups.

There is another class of substances generally known as "Cakes" and their use in India as fertiliser is becoming popular. The following are some of those used commonly in India. (i) Castor cake, (ii) Cotton-seed meal, (iii) Mustard cake, (iv) Linseed cake, (v) Neem cake, (vi) Groundnut cake, (vii) Mohwa cake, (viii) Til cake, (ix) Poppy and (x) Kusum cake. Experiments with these cakes indicate their definite advantage in their use as fertilisers.

The major problem in tropical agriculture relates to the retention of organic matter in soils. The oxidation changes in these soils proceed practically at the same rate throughout the year, unlike in the temperate regions and as a consequence considerable losses of fertili-

sing ingredients take place even during the periods of fallow. It is necessary therefore for the efficient utilisation of organic manures-the supply of which is rather limited-that the oxidation changes should be so controlled as to benefit the crop to the maximum extent.

It has been shown by Subrahmanyan, Rajagopalan, Harihara Iyer and others that the use of relatively small amounts of certain chemicals such as manganese and iron salts facilitate the oxidation of organic matter in soil and catalyse the release of plant food during the life-time of the crop, thus enhancing crop yields.

Iron and manganese salts such as potassium permanganate, manganese-dioxide, manganous sulphate, ferric oxide etc., after thoroughly mixing in suitable quantities with organic manure before application to land give significant increases in crop yields ranging from 20% to 100%. These chemicals help in the oxidation of organic matter and thereby catalyse the release of plant nutrient. They exert a beneficial influence on the microflora of the soil which in their turn help in fixing nitrogen and increase the fertility of the soil.

These chemicals when used with the composting materials, enhance the ultimate fertilising value of the resulting product and exert a beneficial effect on the growth and multiplication of nitrogen fixing bacteria and actinomycetes.

The mechanism of action of these salts is very interesting. The initial fermentation of the manure or decompositttion of organic matter in soil gives rise to the formation of small amounts of ammonia. This interacts with the added salt to precipitate its hydroxide, which on exposure to air gets converted into its higher hydrated oxide (hydrated manganese dioxide or ferric oxide). In this condition the oxide is highly reactive and acts as an "Oxygen carrier" taking oxygen from atmosphere and passing it on to organic matter to bring about its oxidation to a greater extent.

Number of field trials conducted with these chemicals indicate that crop yields can be increased to the extent of 20% to 100%.

So it can be seen that the chemical mixtures added to the soil along with the manure increase the crop yields.

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COTTAGE INDUSTRIES IN FREE INDIA

The development of cottage industries is primarily the responsibility of the State Governments. The functions of the Central Government relate to co-ordination and general guidance, training of instructors, research and the development of export markets.

This is a brief review of the action taken by Central Government in exercise of these functions.

IN a country like India which is predominently agricultural cottage and small-scale industries have a very important role in the national economy, offering as they do scope for individual, village or co-operative enterprise, and a means for the rehabilitation of displaced persons. As agriculture is essentially a seasonal industry, there is need for a supplementary occupation for the cultivator that would provide him with continuous employment and add to his income. A supplementary occupation of this type that is particularly suited for the better utilisation of local resources and for the achievement of local self-sufficiency in respect of certain essential commodities like food, cloth and agricultural implements, can be provided by cottage industries. The healthy expansion of cottage and small-scale industries depends upon a number of factors like the provision of good quality raw materials, cheap power, technical advice, organised marketing of their produce and where necessary, safeguards against competition by large scale manufacture. The education of the worker in the use of the best available technique is also important.

The Industries Conference which met at Delhi in December 1947 requested the Government of India to investigate how far and in what manner these industries could be co-ordinated and integrated with large-scale industries. The Government of India accepted this recommendation. It has been examined, for example, how the textile mill industry can be made complementary to, rather than competitive with, the handloom industry, and certain varieties of textile production have been reserved for the handloom industry. In certain other lines of production such as the manufacture of agricultural implements, textile accessories and parts of machines and tools, it should be possible to produce components on a cottage industry scale and assemble these in a factory. It is proposed to investigate as to how far the industries that are at present highly centralised could be decentralised with advantage. The Industries Conference also recommended that Government should establish a Cottage Industries Board for the fostering of small-scale industries. Government accordingly constituted a Cottage Industries Board consisting of representatives of States and a few cottage industries organisations. The functions of the Board were to advise Government on the organisation and development of cottage industries and the manner in which these could be co-ordinated with large-scale industries.

The Board was also to examine schemes of State Governments for the promotion of cottage and small-scale industries and to co-ordinate these, and finally to advise Government on the marketing of the products of cottage and small-scale industries at home and abroad.

The Board held its first meeting in December 1948 and adopted a large number of resolutions making recommendations to the Central and State Governments on a variety of problems relating to cottage industries. Among other things, the Board recommended the establishment of a Central Cottage Industries sales Emporium at Delhi, assistance for the export of cottage industries products, publication of a journal to serve as a vehicle for technical and commercial information on cottage industries, the setting up of a central institute for the training of instructors and for research in the utilisation of raw materials and machinery, and lastly, the organisation of cottage industries on a co-operative basis. The Board also recommended the establishment of a Cottage Industries Board in each State, reservation of specific fields of production for small-scale and cottage industries vis-a-vis the large scale industries. and the appointment of special technical officers to look after the various aspects of the development of cottage and small-scale industries. Regarding the handloom industry, the Board recommended the setting up of a Standing Sub-committee to look after its interests. The Board was of the view that there should also be other sub-committees for important cottage industries.

The Government of India in the Ministry of Industry and Supply accepted all the recommendations of the Board and have been trying to implement them either independently or in co-operation with the State Governments. A Central Cottage Industries Emporium has already been established. The Emporium which is visited by members of the foreign Embassies in New Delhi and other foreign visitors to the Capital, contributes a great deal to the advertisement of the Indian cottage industries products abroad. Besides the Emporium, show-windos and show-rooms have been opened at certain air ports, on board the luxury liner 'Queen Mary', and in a few of the Indian Embassies abroad. Arrangements are also complete for sending Indian cottage industries products for exhibition in the first United States International Trade Fair to be held in Chicago in August 1950. This will involve an expenditure of about Rs. 1,00,000.

Pending the formation of an export corporation a Provisional Committee has been set up with an initial fund of Rs 1,00,000 for the purchase of Indian cottage industries products and their sale in the United States. A committee formed in the Indian Embassy in Washington will assist the Committee in the sale of these goods in the U. S. A. The first consignment of goods will be leaving for the U. S. A. shortly.

A number of technical officers have already been appointed by the Central Government and others will be appointed soon. A delegation was sent to Japan to study Japanese methods and to purchase Japanese

machinery suitable for cottage industries in India.

An Expert Committee was appointed to examine in detail the scheme to establish a Central Training and Research Institute for Cottage Industries and Government have selected a site at Harduaganj near Aligarh to locate this Institute and the work is progressing. It was also decided on the recommendation of the Expert Committee to establish a Women's Wing of the Contral Training and Research Institute for Cottage Industries. This has been established at Queensway, New Delhi.

The Standing Handloom Subcommittee has already met and madeits recommendations to Government. One of the main recommendations of this committee was to create a fund of Rs. 1,00,00,000 for the development of the Handloom Industry. Accepting this recommendation the Government of India started a Handloom Development Fund with an initial grant of Rs. 10 lakhs last year. Proposals to eastablish other sub-committees as recommended by the Board are being examined. The Ministry of Transport are giving transport facilities to cottge industry products. The Ministry of Labour are examining the question of minimum wages for cottage and small-scale workers and the Ministry of Agriculture are taking steps in respect of self-sufficiency in the matter of food and manufacture of palm gur on an extensive scale. Raw materials like steel, tin plates, electrical steel and non-ferrous metals are being provided to cottage and small scale industries by the Cottage Industries Directorate and the question of integration between these and the large-scale industries is also engaging the attention of Goverment.

In February 1950, the second meeting of the all-India Cottage Industries Board was held at Jaipur where the progress made, since its first meeting at Cuttack, was reviewed. The Board expressed satisfaction at the establishment of the Central Cottage Industries Emporium, the reservation of certain fields of production for the handloom industry, the Central Govern ment's decision to purchase cottage industries products to the extent of onethird of their requirements, and the display of high class cottage industry products in foreign exhibitions and Indian Embassies abroad.

The Board adopted a number of resolutions recommending protection to cottage industries vis-a-vis imports and large scale industries, purchase of cottage industries products to meet Government requirements, early establishment of the Central Training and Research Institute of Cottage Industries and the establishment of a commercial corporation for the development of the export trade, supply of raw materials and the management of Emporia. It also recommended the organisation of Industrial co-operatives, extension of credit facilities, preparation of an all-India directory and the holding of all-India exhibitions of cottage industries products at the time of the annual meeting of the Board. Pending the establishement

of a commercial corporation, the Board recommended the appointment of an interim Committee for the Central Cottage Industries Emporium.

The Government of India have accepted most of these recommendations and with a view to placing executive powers in the hands of the all-India Cottage Industries Board, they have not only reconstituted it but have also nominated an executive committee to implement its decisions. The reconstituted Board consists of 48 members including the Hon'ble Minister for Industry and Supply who is its Chairman. The other members include seven representatives of the Central Government 19 representatives of the State Governments, eight nominees of the Central Government and five members of Parliament. The Executive Committee consists of 15 members besides the Hon'ble Minister for Industry and Supply who is its Chairman.

In addition to the Executive Committee, the Board has been authorised to appoint sub-committees for particular purposes.

Besides advising Government on the organisation and development of cottage and small-scale industries, the co-ordination of these industries with large scale industries and the marketing of their products in India and abroad, the Board will function as an executive body exercising executive functions through its Executive Committee.

To give a fillip to small-scale and cottage industries in Part 'C' States, Industrial Advisory Boards have been set up in Bhopal, Coorg, Madhya Pradesh, Kutch, Manipur, Tripura, Bilaspur, Ajmer and Delhi. On the advice of these Boards loans and other assistance will be given for the development of small-scale and cottage industries.

The total budget provision from Central revenues for the development of cottage industries other than the handloom industry is Rs. 16 lakhs. For the development of the handloom industry grants totalling Rs. 3,40,000 were given to different States for expenditure on approved programmes last year out of the Handloom Development Fund.

FUNDAMENTALS OF MODERN SOIL CHEMISTRY

Genesis and Development of Bernard Dyer's Principles

THE comparative novelty of some established principles of soil chemistry and the character of the man who initiated important phases of it were recalled in London recently by Sir John Russell, F.R.S. He was presenting before the Society of Public Analysts and other Analytical Chemists the first Bernard Dyer Memorial Lecture, commemorating the distinguished analytical chemist whom he knew for some 50 years.

Phosphorus and Potassium.

One of Dr. Dyer's earliest achievements said Sir John Russell, was in the determination of available phosphorus and potassium in soil by preliminary extraction with a 1 per cent solution of citric acid. It was the subject of the thesis for which he was awarded his doctorate by the University of London, and of important confirmatory work which he carried out later at Rothamsted. The speaker went on to describe the widening interest in soil chemistry, reflected ultimately by the creation of the Agricultural Research Council.

The processes by which plant roots take up their nutrients from the soil, said Sir John Russell, has been shown to be much more complex than was at first thought; and what is "available" to one plant may not be "available" to another.

The present-day problem was to find analytical methods that would give some measure of the amount of nutrients that crops, under normal conditions, could obtain from the soil.

Dyer's method came into wide but not universal use. Other solvents, in steadily increasing numbers, had been proposed but no two gave the same results.

This problem has been taken up at Rothamsted by J. A. Prescott and the lecturer, who found that when dilute acids act on soils, two reactions proceed simultaneously; the acid dissolves phosphate, but the soil slowly absorbs it from the solution.

This back-action is eliminated by using a diffusion technique, which shows that tenth normal citric, hydrochloric and nitric acids all extracted the same amount of phosphorus; whereas by the ordinary analytical method the citric acid extracts nearly twice as much as the hydrochloric acid and 50 per cent more than the nitric acid. The citric acid does this because it reduces the difference between the amount extracted by the acid and the amount reabsorbed by the soil.

Only the direct action is wanted by the analyst, the second action upsets his results. So long as he is dealing with similar soils he can assume that the reverse action is also somewhat similar and that his results will still be comparable; but when he is dealing with different

soils the reverse action may be different and he may get different analytical results, even though the same amounts of phosphorus have been extracted. Standards applied to one soil cannot necessarily be applied to another.

Modern developments in technique have profoundly changed the whole subject. Citric acid long retained its popularity because it extracted easily weighable amounts of phosphoric oxide and of potassium. This advantage was lost with the use of modern turbimetric, colorimetric and spectrographic methods, with their ability to deal with amounts too small to be satisfactorily weighed.

These new methods, along with automatic balances and pipettes, have speeded up analytical determinations enormously and vastly increased the number of analyses that can be undertaken.

Field Experiments.

We have to-day obviously gone a long way from the ideas that formed the background of Dyer's early work. The methods are at present empirical, so that the analyst needs close contact with field experiments to satisfy himself that they are reliable. He has to have a mind sufficiently open to reject them when they ceased to be so, and sufficiently alert to devise others that would be better.

That, however, is no new situation for a consulting chemist. His work lies largely in regions not yet tidied up by the science of the day; his equipment has always to be a wide kowledge of scientific methods combined with ingenuity of invention, soundness of judgment and complete intellectual integrity.

It is because Bernard Dyer possessed these qualities in so marked a degree that they honoured his memory.

PAPER INDUSTRY IN MYSORE

THE establishment of a paper-mill, known to-day as the Mysore Paper Mills, in the Mysore State, along with the development of certain other important industries, furnishes a striking illustration of the Government of Mysore's enterprising policy in the matter of industrial development. The war convincingly demonstrated, as nothing else could perhaps have done, the vital importance of the paper industry to the country's economy. During the pre-war years, India's total consumption of paper was 2,03,574 tons, of which 1,49,975 tons were accounted for by imports, while the rest i.e., 53,599 tons, consisting almost entirely of printing and writing papers, represented the contribution of the indigenous industry. With the outbreak of war, the foreign sources of supply were almost wholly eliminated, and India had to depend upon its own resources for supplying the entire defence and civilian needs of the country. It is no small tribute to the paper industry in India that it should have been able fully to rise to the occasion inspite of certain inherent handicaps and limitations. With the enforcement of economy and strict regulation of consumption among all the essential users, accompanied by a production drive aimed at maximising production up to installed capacity, the industry saw the country through a period of unparalleled crisis and difficulty. In 1944 Indian production reached an all-time high level of 1,03,883 tons. The part played by the near units, such as the one in Mysore, which were yet in their non-age when hostilities broke out, is particularly noteworthy because in their case the war provided not so much an incentive or opportunity of making large profits (as in the case of the older and well-established concerns) as an occasion for rendering service to the country by sustaining its economy through a period of great stress. With a production round about 4,000 tons annually, the paper industry in the Mysore State was called upon to meet the needs of the Government of India and the Government of Mysore and the civillian and educational needs of the State itself in which it is located and of a large part of South India.

As is well known, the passing of the Bamboo Paper Protection Act in 1925 gave a fillip to the development of the paper industry in India. The use of Bamboo pulp in place of imported wood pulp in the manufacture of paper was greatly encouraged by this and subsequent fiscal measures taken by the Government of India from time to time with the result that the use of imported wood pulp by the Indian Mills fell rapidly from 20,081 tons in 1931 to 10,976 tons in 1939. The availability in plenty of this main raw material, bamboo, in the forests of Mysore, particularly in the Malnad district of Shimoga, and the abundant supply of cheap hydro-electric power as well as the existence of a market in South India, were factors which influenced the Government of Mysore in decid-

ing upon the setting up of a paper mill in the State at Bhadravati, though certain essential materials like coal and chemicals like caustic soda are not locally available but have to be imported into the State from long distances. The projected development, however, of electro-chemical industries in the Bhadravathi area by use of the large block of power available from the Mahatma Gandhi Hydro-electric Works at Jog may be expected to go a long way in making the paper industry in the State self-sufficient in respect of some of the main chemicals like caustic soda and bleaching powder, though in the absence of any indications of the existence of any deposits of coal in the State, the paper iudustry, in common with other industries in Mysore, will continue to depend upon other parts of the country for its coal requirements.

The future development of the paper industry has been the subject matter of expert examination by a Panel constituted by the Government of India in the late Department of Development and Planning. The Pannel visualises that the consumption of writing and printing paper in India would increase to 2,00,000 tons by 1956 and that the country's increased requirements could be met in full if, by then, their recommendations for starting new mills—10 in number in certain specified areas–and for the expansion of the capacity of the smaller existing mills at least up to 8,000 tons a year each, were implemented. But, as is well-known, all plans for post-war industrial development, whether relating to the expansion of the existing units or the installation of new ones, are encountering two primary difficulties. One is the difficulty of finding the requisite finance owing to the paralysis which has overtaken the stock and capital markets. The second is the prolonged delivery time (not to speak of the inflated prices which are often 300 to 400 per cent above pre-war price levels and which would inevitably lead to over-capitalisation) quoted by manufactures of capital goods in foreign countries. On account of these grave handicaps, plans of development of the paper industry, as of other industries, are not making as much headway as was expected. It may however, be mentioned that at least 10 new schemes for the manufacture of paper and board involving an aggregate issue of capital of over Rs. 20 crores, are on the tapis, and of these two new units are to be located in the Mysore State and Coorg respectively. In the existing inflationary conditions in India, for which production and yet more production is the sovereign remedy, the prospects of any addition to the country's industrial potential must undoubtedly be welcomed, though the principle of regionalisation and dispersal of industries which is a basic requirement of sound economic planning should not be ignored in locating the new units. The management of the existing paper mill in Mysore have also under their active consideration plans for expanding the capacity of the Mill to 10,000 tons from the present level of 4500 tons per annum, though for the reasons already mentioned, progress has not been as rapid as might be desired.

The consumption *per capita*, of paper affords a true and revealing

index to a nation's progress all round. The fact that the *per capita* consumption of paper in India as a whole is only 1 lb. per annum as contrasted with 300 lbs. in the U.S.A., 185 lbs. in Canada and 152 lbs. in the U.K., furnishes a sad commentary on our backwardness in the educational, industrial and political sectors. This pitifully low consumption of paper corresponds to the deplorably low level of literary in the country, while the consumption of paper in the U.S.A., which is far and away the highest in the World, is in keeping with its amazing material progress and its vigorous democratic life. The growth of democracy is an important factor which assists and is assisted by a growing paper industry. From this point of view, the advent of freedom in India and the expected inauguration of the new democratic constitutions in the year 1950 in the centre and all the provinces and states and the greatly increased tempo of political activity and educational progress that will ensue in the country as a whole in the years to come, augur well for the future of the paper industry. For, democracy thrives on an abundance of paper. And paper must not only be abundant in supply but also cheap in price and—it may be added—acceptable in quality. In this context, the development of the newsprint industry must be regarded as especially vital to the economic and political growth of India. The launching, therefore, of the well publicized newsprint industry in the Central Provinces and the attempts made elsewhere in this direction will be watched with particular interest.

The paper industry was 'deprotected' from April 1947 by the Government of India on the recommendation of the Tariff Board. This need hardly discourage further investment in the expansion of the industry. For, apart from the general assurance that the national Government at the Centre can be trusted to safe-guard the industrial future of the country, the Government of India are definitely committed to a review of the question of reimposition of protection to the paper industry, should circumstances warrant such a course and the position of imports place the industry in jeopardy. That the Government of India are alive to the importance of this industry to the national economy is clearly demonstrated by their statement of industrial policy formulated in April 1948 which envisages this industry "as one of those basic industries the planning and regulation of which by the Central Government is necessary in the national interest." In view of the steady denudation of the soft wood forest areas in the Western countries and the long years required for their regeneration, the World will come to depend more and more on bamboo for its raw material and it has therefore a bright future, and the industry in Mysore, which, incidentally, owes a great deal to the local Government, can, therefore, look forward to the coming years with confidence.

FACTS THAT INTEREST

Crewless Lightship.

Crew of the lightship EXP-99, to guide ships into New York harbour, will be entirely electronic equipment—no men. Built by Westinghouse Electric Corp. for the U. S. Coast Guard, the 91-ft. ship will be remote-controlled from shore stations. Single shore-based operator will control the ship's lights, radio and radio signals. Signals returned by ship's electronic devices will tell shore station how equipment is operating.

Centrifugal Casting Process Produces Iron Soil Pipe.

Centrifugal casting, long employed for making cast-iron pressure pipe, is finding wider adoption for soil-pipe production. Combustion Engrg. Superheater, Inc., has combined this type of casting with self-contained sand handling.

The machine used, a Herman Rol-O-Cast, makes pipe in sand-lined flasks. An electronic control system is the nerve centre of the complete installation; it automatically directs some 25 timed sequences in each operation cycle.

The unit requires 2 min. for each cycle, producing four 5-ft. lengths of 40-lb., 4-in. I.D. pipe. Cycle of operation is: fill cylindrical flask with sand, spin at 1,000 rpm., insert mandrel and spin at 600 rpm. to smooth sand now lining the flask, withdraw mandrel, and pour iron with flask speed at 850 rpm.

Amount of metal poured governs wall thickness and inside diameter of pipe. So metal weight is measured to within a 5% tolerance. Cast pipe is ejected by air-operated plungers. No annealing is necessary.

Molding sand is carefully controlled to: green compression strength 16 lb., permeability 96, flowability 70, grain size 57, moisture slightly less than 5%.

Recovery of Waste Heat Is Source of Plant Economy.

Waste-heat recovery has almost limitless possibilities. A wide variety of waste-heat boilers and water heaters have been designed to increase operating economy in chemical plants, oil refineries, paper mills, cement mills, power plants and other types of manufacturing plants.

But any company, before plunging into waste-heat recovery, should determine its economy by studying these factors:

1. Quantity of heat available at temperature level above that of the heat-recovery absorption medium.
2. Permanence of heat source.
3. Value of recovered heat in usable form.
4. Permanence of value of recovered heat.
5. Value of control to primary operation offered by heat-recovery system.
6. Cost of heat recovery.
7. Cost of alternate means of disposing of excess heat, controlling primary operation, and producing equivalent heat.

Simplest form of waste-heat boiler is the fire-tube type. Water-tube boilers also may be applied to this service. Another type of equipment getting attention for heat recovery is the heat pump. In Switzerland, for example, a number of heat-pump installations for heating water already have been made.

Electric House Heating.

Novel house-heating system has been developed to try to make electric heating practical. Basically the furnace consists of conventional glass filter and fan for incoming air, plenum chamber, central heater and duct heater for each outlet.

Each duct is equipped with a thermally operated damper. There are a thermostat in each room and a magnetic switch in the furnace for each duct heater. Each duct heater draws 3 kw., but demand of each drops as more heaters go on the line.

Good results were reported from tests. Installation cost was about 60% of that of conventional oil heating system. For an insulated house of 1,300 sq. ft., annual heating cost in Oregon runs about $100.

Motor Vibration Cured by Diagnosis Treatment.

Motors that vibrate need diagnosis, not guesswork. A good place to start checking is when the motor is being brought up to speed.

If vibration starts before motor is up to speed, the trouble is likely to be mechanical, such as unbalance or mis-alignment. If vibration is present after a synchronous motor is synchronized, the trouble then is probably electrical, such as a partially shorted winding.

In the latter case, the field winding is checked for shorted turns by the dc.-drop or ac. methods. The first test is earier to make but not as accurate as the ac. method.

The dc.-drop test consists of either measuring each field winding with an ohmmeter or applying less than rated excitation voltage across the collector rings and measuring the voltage drop across each pole with a voltmeter. In ac. testing, 120-volt potential is put across each yole and the current measured.

If the trouble appears to be mechanical, the first check is the motor footing for proper shimming, then the alignment of motor and driven equipment, the grouting and base installation, and the load for unbalance.

Meter Measures Hemoglobin.

Hemoglobin determinations can be made accurately in 3 min. with a portable Hb meter developed by American Optical Co., Instrument Div. The Hb meter operates on the principles of a photometer, matching the color intensity of a split field.

Light coming to one side of the field passes through a hemoglyzed blood sample. Light coming to other side passes through a wedge with permanent absorption characteristics. Movement of the wedge matches color intensity. Hemoglobin content is read from scale on housing.

Tube has 400-Digit Memory.

New memory tube, developed at Massachusetts Institute of Technology, looks like a glass automobile muffler with an extra pipe coming out of one end. It can store 400 digits by recording a choice of two digits in any of 400 different positions.

The tube will be particularly useful for computing machines that solve all their problems in terms of so-called binary digits. It can receive a number in 0.00002 sec. and give one out just as fast.

The memory takes place on electrical islands made by beryllium metal deposited on a sheet of insulation in a minute checkerboard pattern. An electron beam acts as a writing beam and selects a small area of the storage surface to apply either of two voltages—one meaning yes and the other no.

Later, the beam can be redirected at the area to read off the signal it

applied earlier. Information can be held as long as power is on.

Pest-Proof Package Wrap.

An inexpensive, easy-to-handle pest-proof wrapping material has been developed by the Pest Infestation Laboratory, Slough, England. It is cellulose wadding impregnated with DDT.

This material is suitable for wrapping small, individual packages packed in shipping containers. It should have a wide range of applications for packaging foods exported to tropical areas.

Wadding thickness ranges from 4 to 20 layers. Each layer is made of paper pulp spread so thinly that it constitutes a net-work of tiny holes and tunnels. The paper is slightly crimped so that if insects penetrate the carton they wander in the "labyrinth" and die before making any further penetration.

Other advantages of the material: wadding is flexible and does not have to be sealed around the packages.

Synthetic Resins Bond Hardwood into Strong Paper.

Offset papers from hardwoods may be the result of work at U. S. National Bureau of Standards. Synthetic resins (melmine-formaldehyde) substitute for the national fibre-bonding gel usually developed through use of a large amount of softwood pulps.

In making paper, pulp is beaten in water to gelatinize some of the cellulose. This usual practice affects adversely some properties needed for good printing quality. Using synthetic resins as a binder both minimizes the adverse effects and permits a reduction in beating time.

Up to 75% hardwoods has been used effectively. Beating time was 1½ instead of 9 hr. Each machine run was 50 lbs. of pulp and 1% of resin size.

The resin was added as a colloidal solution to the paper stock just ahead of the head box where temperature was maintained at 90°F. Heat of drying cylinders completed polymerization of the resin, forming a water-soluble bond between the fibres.

Rubber-Covered Cables Spliced without Molds.

New, effective technique makes vulcanized joints and patches in rubber-covered cables without metallic molds. Essential feature of the method is use of pressure tapes around the joint during hot vulcanization. Electrical quality of joints is outstanding.

Step-by-step procedure is to:

1. Apply rubber cement on splice and dry,

2. Wrap on rubber splicing tape with 50% overlap, starting ½-1in. outside the pencilled scarf.

3. Apply code tap "straight jacket" with customary longitudinal joint overlapped to get a good conductor centre.

4. Apply pure gum rubber strip to compress splicing stock.

5. Wrap on ½-in. cotton binder tape with 50% overlap.

6. Apply tinned copper tape; this tape distributes heat uniformly.

7. Apply black code tape, which provides surface for absorbing radiant heat.

8. Vulcanize for 1-30 min., depending on conductor size and wall thickness. Copper and cotton tapes and also the straight jacket, if desired are then removed to complete the job.

News & Notes

Modern, Compact Plant, Bleaches Sulphate Pulp.

New bleaching plant of Frazer Cos. Ltd. at Edmundston, Canada, is designed for bleaching sulphate pulp at a rate of 120 tons of fibre per day. It carries out the usual functions of chlorination, extraction, brightness development, and brightness stabilization.

Chlorine is added to the pulped stock in the chlorinating tower. The stock then passes to three high-density stages. In the first tower, hypochlorite and caustic are added at the mixer; in the second, caustic; in the third, hypochlorite and caustic.

Stock is pumped to a decker-type washer and thickener where it is thickened to 6% consistency, then to line mixer and low-density towers. In each of three towers, hypochlorite and caustic may be added for required brightness.

From the last tower, the stock is pumped to another washer, thickened to 3½%, passed through a line mixer into the base of a reaction tower. Here it is stabilized with SO_2. Stock overflowing from this tower is pumped to a washer, then flows to the screens.

Smythe flat screens do the final screening. Stock from the screens is pumped to three deckers, thickened to 4 per cent, dropped into the storage chest, and there held until delivered to the paper mill.

Big Lignite Deposits:

The results of the investigation of the lignite deposits in the South Arcot district of Madras have been recorded. The investigation was undertaken in October 1943 and continued up to the beginning of 1947. A reserve of 35,20,00,000 tons of lignite has been estimated.

"Sillimanite"

The importance of the sillimanite group of minerals in the field of neutral high-alumina refractories and ceramics is now universally recognised and the world's largest concentration of sillimanite occurs in the Khasi Hills of Assam. The minimum reserve in the area has been estimated to be 2,51,000 tons.

Manufacture of Power Alcohol:

According to a Press Agency Report an Austrian firm has approached the Government of India with a scheme for the erection of a plant in India for the manufacture of power alcohol by the most modern efficient and cheap processes. The scheme envisages the establishment of an independent factory for the production of power alcohol from sugar molasses with a capacity of 3,510 gallons per day. The cost of the mechanical equipment required is placed at Rs. 6 lakhs. The Austrian firm is prepared to operate this factory in collaboration with Indian partners. On its part, the firm will supply the necessary machinery and the technical knowhow. It is said that the Government of India have forwarded the firm's proposal to the Federation of Indian Chambers of Commerce and Industry for consideration. Government have indicated willingness to offer foreign exchange and other necessary facilities for the

implementation of the project, if approved.

Build Damage-Free Box Car.

A 50-ton all-steel box car, built by General American Transportation Corp. and Evans Co., is designed to give maximum shipping service, capacity loading, high monthly mileage, low maintenance, and reduced damage claims. These benefits will offset the 50% increase in first costs. No attempt was made to reduce the car's overall weight.

To make capacity loads possible, eliminate dunnage, and reduce labour costs, the cars are equipped with D-F (damage-free) loading device. Device makes it possible to increase load about one-third. It also makes possible safe handling of partial and full loads of odd shapes.

Loader consists of angles, punched for cross members, applied horizontally from door posts to corner posts. They are welded to all posts with removable sections of angle to apply in door openings. Cross members have locking devices at ends. There are eight rails per car.

Warns of Engine Failure.

Principle of magnetic sump plug as engine failure indicator is being used by Sevenska Aeroplane AB. Sweden. Device can detect an incipient engine break-down as soon a disintegration begins.

Unit consists of a sump plug mounting a silver centre electrode with six holes around its edge. Six separate electrodes partially obstruct holes. Oil may pass freely, but metal particles are caught.

Three-Color Picture Tube.

Color-television has been given even greater life by a new development by Radio Corp. of America- a three-color picture tube. The previous RCA system (McG-H Digest, Feb. p27) employed three picture tubes in the receiver.

The new tube uses 3,51,000 color dots; one-third is red, one-third blue, and the other one-third green. The color dots are arranged in triangular groups of three dissimilary colored dots each.

Immediately behind the tube face is a metal mesh screen with 1,17,000 holes. As electron beam scans the tube face, electrons pass through the holes. Whether the beam falls on red, blue, or green portion of the groups is determined by information contained in the video signal.

The tube operates on 525-line definition, so receivers designed for use with the tube are compatible with black-and-white receivers: that is, present sets would receive color televised programs in black and white.

Cleans Motors Centrifugally.

Cleaning and flushing of gear cases of motors on demand and time switches are done on a centrifuge at Narragansett Electric Co. The centrifugal action throws out old oil and chips. It consists of a flat disk fitted snugly inside a cleaning machine basket. Gear cases are bolted to the disk. The devise can even be used on a lathe, drill press, or small motor by modifying the mounting.

Natural Gas for Fertilizer.

A major producer of nitrogenous fertilizers is Phillips Chemical Co., a wholly owned subsidiary of Phillips Petroleum Co. Its process is a modification of the original German Haber-Bosch process.

Natural gas is the source of the hydrogen needed to make ammonia by

reacting nitrogen and hydrogen. The ammonia is then further processed to ammonium sulphate or nitrate, which in turn is blended with phosphorus and potassium to make the fertilizer.

The natural gas is passed through a heat exchanger and over zinc oxide at 750°F. to remove hydrogen sulphide and mercaptan sulphur. Then it is mixed with steam and passed through stainless steel furnace tubes containing nickel catalyst, then through a secondary reformer.

Product contains H_2CH and CO. Its temperature is lowered in a waste-heat boiler, then CO converts to CO_2. Reformed gas passes through a cooler, compressor, and to a monoethanolamine scrubber to remove CO_2.

The gas is again compressed, and CO is removed in a cuprous-ammonium formate scrubber. The process gas now contains the hydrogen and nitrogen needed for ammonia synthesis, plus some inert gases. It is compressed to 5,000 psi. and reacted at 930°F. over an iron catalyst to form the ammonia, which then is condensed and stored until processed to sulphate or nitrate.

Bombay's Income Study:

According to a recent survey made by the Bureau of Economics and Statistics, Bombay, the total income in the Bombay State is estimated at Rs. 576.10 crores. Nearly 36 per cent of the total income was derived from the primary sector comprising agriculture and forest produce. The share of the secondary sector including industry and income from properties comes to Rs. 216.69 crores or 37.6 per cent of the total. The tertiary sector has contributed Rs. 152.05 crores or 26 per cent. The value of agricultural production was put at Rs. 176.61 crores showing a four-fold rise compared with 1938. The survey shows that the real income of the rural population has increased in comparison with 1938-39. The income from organised industries amounted to Rs. 173.22 crores and the total wage bill to Rs. 73 crores in 1948. The textile industry accounted for 65 per cent of the total wage bill. The per capita income of the urban population comes to Rs. 603.5 per annum and of the rural population to Rs. 213.32 per annum.

Agriculture.

Indian International Engineering Exhibition: More than 40 countries have been invited to participate in the International Engineering Exhibition which will be held in New Delhi in January 1951. The exhibition will be organised at a time when four international organisations dealing with agricultural engineering will be holding their meetings in India. The purpose of the exhibition is to show and demonstrate by live and still models the developments in the science and techniques of irrigation engineering.

Cotton-Cleaning Machine:

A new machine for removing trash and other foreign matter from raw cotton has been developed in the United States. The cotton cleaner consists of two concentric cylinders, one within the other. The cotton to be cleaned passes through the space between the cylinders. In the cleaning operation, air from a number of small pressure jets entering through the outside cylinder blasts foreign material from the cotton. This process is repeated a number of times. The dislodged trash is then skimmed off through special openings. The machine is specially useful for machanically harvested cotton.

Beedi Leaf Industry:

Useful information about the beedi leaf industry has been compressed in a pamphlet, recently issued by the Forest Research Institute. It gives details of species of trees the leaves of which are used for beedi wrappers method of collection of leaves, drying, storage, packing and transport and about the financial aspects of the industry.

Development Schemes in Pakistan:

At a recent meeting, the Development Board recommended the grant of loans to different provinces for the implementation of their development schemes. The new loans are based on the amounts which provincial governments were able to utilise in the preceding year. The allocations are: East Bengal–Rs. 1 crore, Punjab–Rs. 4 crores, N.–W. F. P.—Rs. 75 lakhs. No final decision has yet taken on a request for a loan of Rs. 176 lakhs for a scheme sponsored by the Sind Government. Particular attention has been paid to development schemes in East Bengal. The Board has approved the schemes for encouraging the cultivation of fodder crops, for the re-excavation of Kala-pani Khal and two drainage cuts from Teliani and Tenachira Beels, and the construction of a regulator at the junction of old and new course of Tulshiganga river. Half of the expenditure on these schemes will be borne by the Central Govt.

Mushroom Research.

Formed in 1946 by several specialists for carrying out research on the question of dwindling supplies of good quality manure and other problems, the Mushroom Research Association has recently issued its first report.

Attention has been concentrated on the study of composts and particularly on the supplement needed to convert wheat straw into an adequate substitute for horse manure.

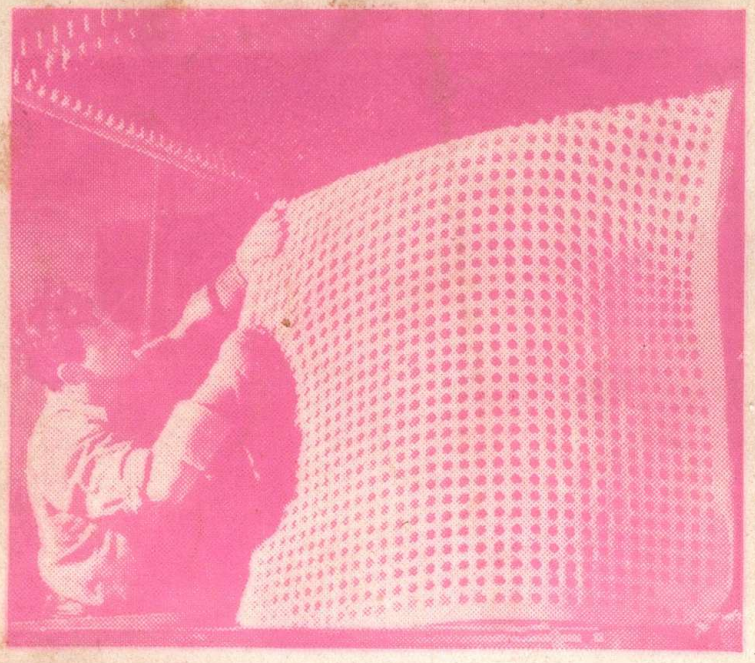
A number of mushroom cropping experiments have been carried out. Progress of fermentation, temperature readings taken daily during some experiments, and cropping results show that commercial growing conditions are being substantially achieved.

The principal work undertaken by the chemistry department has been the analysis of composts at various stages during their preparation and during cropping in order to investigate changes taking place. Work in the microbiology department has covered the composting process, mushroom growth, microbiology of mushroom beds, and disease and competitors of the mushroom.

New industries have been built, land reclaimed for cultivation, floods controlled, and low-cost electricity made available to farm and city dwellers as a result of dams and irrigation projects constructed by the U. S. Government in the Columbia River Basin in north western United States.

Soldiers and trucks of a United States Army division leaving one of the ships of the amphibious force which landed troops and equipment on beaches near Pohang, Korea.

Licence No. 663 Dated 21st July 1949.
Monthly: Annual Subscription Rs. 3/- Single Copy As. 4/-



The Photograph shows a worker in a rubber products plant at Mishawaka, in the midwestern State of Indiana, removing a foam rubber mattress from a mold.

Pittsburgh, Pennsylvania, one of United States' greatest industrial centres.

Printed by P. Sreedharan Pillai at the S. G. Press, Parur and Published by him for The Fertilisers And Chemicals, Travancore Ltd. Alwaye.