FACT

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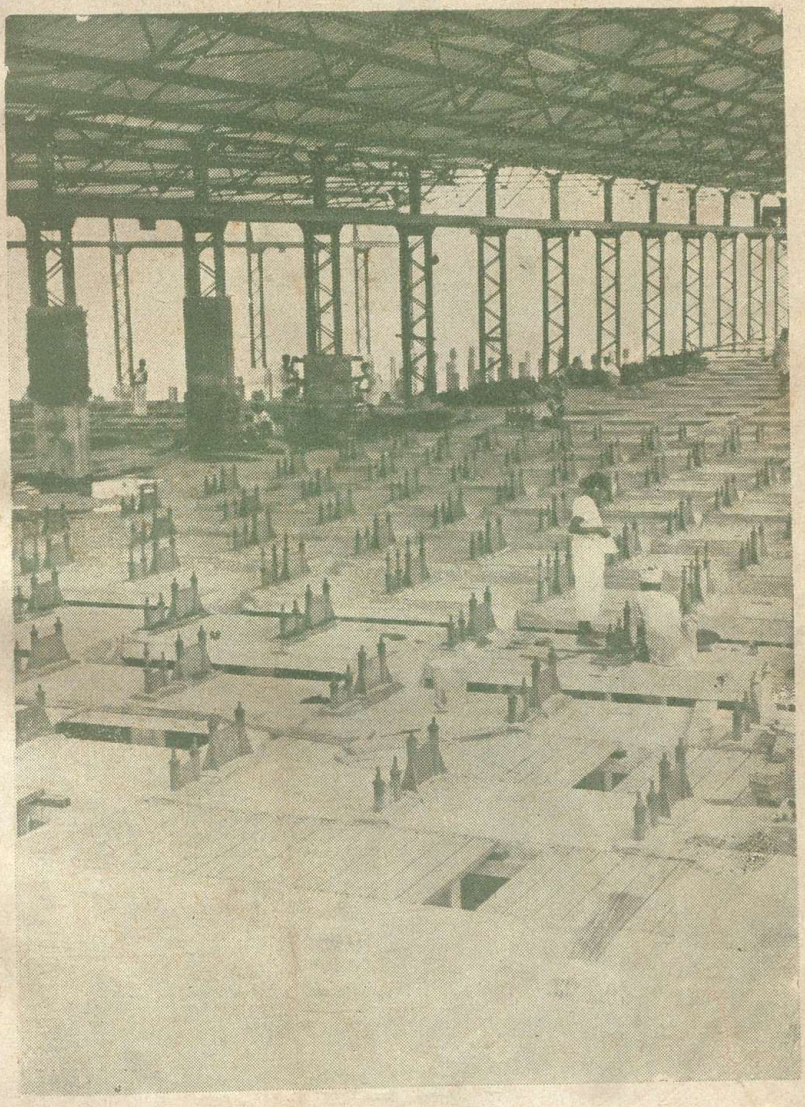
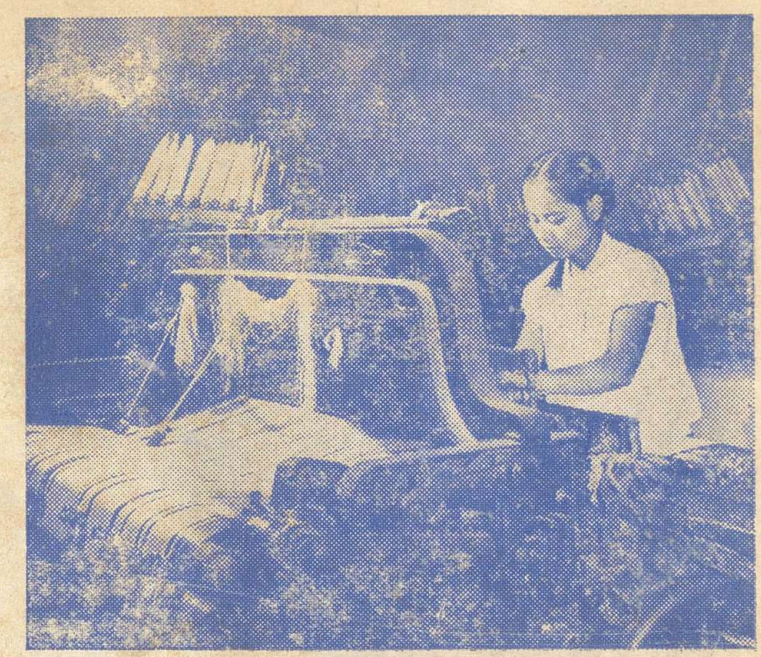


A Section of the Caustic Soda Plant under construction.

FACT Vol. 5. No. 12. Pp. 309 to 337, Alwaye, June 1951.

Men must learn to make the earth produce more than it has ever produced before. The farmer can do this if he has opportunity to learn improved farming methods, if his land rent is fair, and if he and his work animal are well fed and healthy.

With aid from the people of the United States of America, many Asian farmers are vaccinating their cattle against rinderpest. Experimental stations are testing seeds to find varieties which resist disease and drouth and which will produce a greater amount of rice per acre.



The problem facing all Asia today is the feeding, clothing and housing of its ever-increasing population. Men must learn to produce more than they have ever produced before. Clothing must be made more economically so that all may afford to buy what they need.

Aid from the people of the United States of America has helped repair the spinning mills for Formosa's output of cloth. Thousands of new spindles are increasing the production of textiles.

The work continues in Formosa, Burma, Thailand, Indonesia and in the Indochinese states of Vietnam, Laos and Cambodia.

FACT

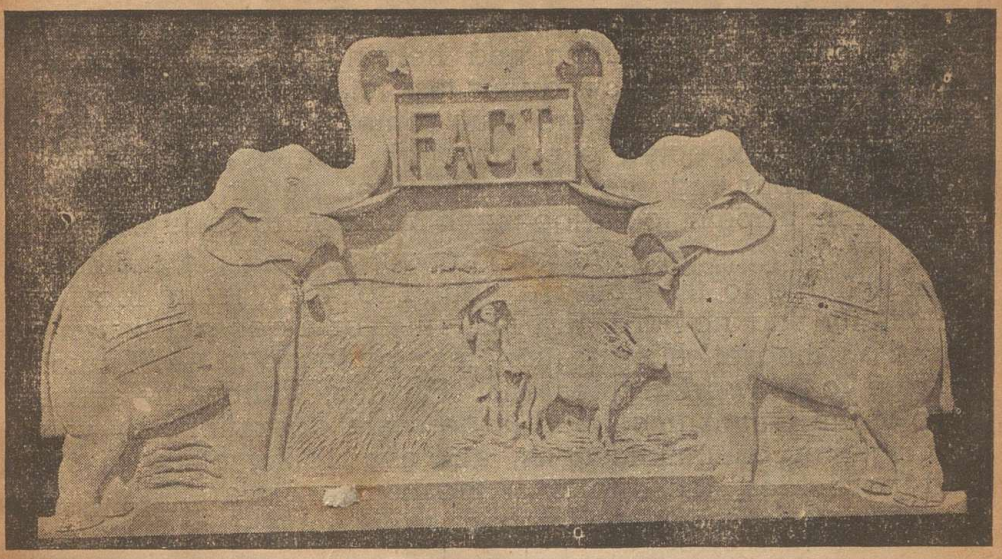
Vol. 5 No. 12
June 1951

The Editorial Board do not hold themselves responsible for the views expressed by contributors.

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

Editor.

In this Issue .....



VOL. 5 | JUNE 1951 | NO. 12

EDITORIAL.

INDIA'S LAND ARMY.

THE President of India, Dr. Rajendra Prasad inaugurated on the 6th of this month, an organisation called the Bhumi Sena or Land Army. This is a band or persons belonging to the non-rural classes whose co-operation and activity are expected to infuse new vigour into the rural life of the country.

The object of this organisation is to instil into the rural agriculturist and labourer a spirit of self-help in the matter of better farming, better living, and better economical self-sufficiency. The men of this land army are mostly from the educated classes and they have entered into this job in a spirit of dedication to a noble cause -- the cause of making agricultural India independant, self-supporting, and efficient in productiveness.

The Bhumi Sena as now contemplated is expected to stimulate enthusiasm for organised three planting, crop competitions, the formulation of development projects, and the recruitment of local labour therefor, as well as for the propagation of improved methods in agriculture.

The scheme is ambitious enough and it is well to stimulate the interest of the educated classes, and the white-collar workers in handling, and helping others to handle efficiently, the country's arduous task of putting its agricultural production on all fours. But, some of the items of work that they are expected to put through, namely, the recruitment of Labour and the propagation of better methods of cultivation, appear to be too much for them to cope with.

For, agricultural working conditions and the methods most suitable to the soil are bound to vary from locality to locality and no hard and fast rule, or a general scheme based on theoretical education, may be found to be of much service to the working peasant. Further, without the active help of the Government and large-scale operations by way of irrigation, communications, and availability of fertilisers and pesticides, the efforts of the land army are likely to degenerate into one of demonstration only.

> As it is, out of the total cultivated area of the land, only about eight per cent is canal irrigated; and all other forms of irrigation account barely for another sixteen per cent. The remaining seventy-six per cent have entirely to depend on the vagaries of the monsoon for their water supply, and unless this state of affairs is speedily improved and irrigation made available to the major portion, things will have a tendency to drag on as before, inspite of demonstration or propaganda.

The procurement of good seed and fertilisers is often hindered as much by financial difficulties as by ignorance or apathy, and this could only be overcome by the establishment of rural credit banks on a very wide and liberal basis.

As a means to awaken a new enthusiasm, real and effective display of a spirit of public service on the part of university graduates may certainly bring forth good results if they are prepared to understand and enter into the spirit of rural India. It is not teaching or correction of hereditary errors that is wanted, but a spirit of sympathy for understanding the difficulties of the average cultivator, a readiness to see eye to eye with him in the narrow ambit of his own personal requirements hopes and ideas, and the good sense to tolerate him and work with him, carrying him along the lines of least resistance, onward to improvements, which would neither ruffle nor surprise him by the inevitability of their gradualness.

This was the method envisaged by Gandhiji in his gigantic scheme for regenerating the agricultural worker and the small farmer, and if the Bhumi Sena do adopt the Gandhian Way, they are bound to be a very useful instrument for leading the country on to the gates of Prosperity and Economic Stability.

CAREER PLANNING

By
N. J. BALANI

IN India, one of the main obstacles to industrial development, next in importance only to the limitations imposed by our financial resources, is shortage of technical personnel of the required training and experience. Efforts are being made to increase educational facilities in the technological institutions with the object of turning out more graduates with technical qualifications. But little is being done towards planned development of the existing personnel in the industry to improve their level of performance and equip them for greater responsibilities. Each one of us possesses some qualities which are dormant and of which we are not aware or even if we are aware, the organization that uses our services is not aware and/or does not use them to the best advantage. Emphasis is laid on efficiency of machines and production of goods but the fact that industry produces men as well as goods is often overlooked An employee is the only asset of an organization that is able to increase its value by its own efforts. The difference between an effective organization and an ineffective one boils itself down to a difference in people and, therefore, development of its own people should be one of the primary concern of every organization in the country.

The Career Planning Scheme herein described was originally formulated by the Bell Telephone Co. of Canada and subsequently adopted by the Hydro-electric Power Commission of Ontario, who have in recent years been confronted with the problem of manpower development to cope with their expansion programme of an unprecedented character initiated after the war. The magnitude of the problem may well be realized from the fact that the total staff of the Commission in 1944 numbered only 4,353 against 19,893 in 1948 recording an increase of nearly 400 per cent in 4 years. The electrical developments, past and projected, in a single province of Canada under the control of a single Commission are nearly twice the present achievements and feasible aspirations during the next five years of the whole of India. The magnitude of the engineering work involved in the design, operation and maintenance of this large system can, therefore, well be judged and the associated problem of manpower planning appreciated. This article deals with only one aspect of manpower planning, viz. development of the individual employee for better service to the organization.

Objects.

Career Plannig has been termed as "A Plan For Everyman", Its objects are twofold—firstly, to make a periodical personnel inventory or an estimate of the displayed capabilities and the estimated potentialities of the occupants of positions,

and secondly, to afford opportunities and provide the necessary assistance to each individual to develop his abilities with the ultimate aim of bringing about the best use of his talents to the common interest of the organization and the employee. Accurate job specifications and acceptable standards for measuring the effectiveness of the individual in the job are the pre-requisites for the successful operation of the plan.

Outline of the Plan.

In this discussion, by "supervisor" of an employee is meant a person who normally provides direction to the employee in his work, or the person to whom the employee reports in his normal duties. By the "second supervisor" is meant the officer holding a post next higher to the immediate supervisor. A supervisor may have one or more men working under him and he himself would be under another supervisor placed higher than him in the line organization.

(1) At regular intervals, say once a year, the current performance and the stage of development in the position held by each employee are reviewed by his supervisor and his second supervisor working together. Before their findings are recorded, the immediate supervisor has an informal chat with the employee who is encouraged into talking his own job and the way he feels about it and disclosing his own interests, desires and ambitions.

(2) The above findings are discussed in a meeting of the Career Planning Board the constitution of which varies according to the rank of the employee under consideration. Generally speaking, the Career Planning Board for an employee consists of the head of his department or section, a representative of the Personnel Management Branch (Career Planning Advisor), his second supervisor and his third supervisor.

(3) The Career Planning Board examine the evidence and by questioning and discussion of the relative merits of different employees, arrive at a collective determination of each employee's present performance and development, recommendation for his future development and possible placement. The Board interview each employee individually and diss with him his performance and development. The Board's deliberations are directed towards two ends, firstly, to appraise each employee's skills and suggest his placement in a position where his highest skills are available for the service of the organization and secondly, to recommend the steps to be taken by the employee himself, by his supervisors and by the organization respectively to improve his present performance and future prospects.

(4) The Board's determinations are conveyed to the employee's immediate supervisor for communication the employee. The employee's concurrence in the proposed plan for training and development for himself is required before it becomes effective.

(5) The employee's "Performance Review and Development

Record", which contains opinions and impressions of individuals, is destroyed and replaced by the Board's recommendations entered on "Placement Planning and Control Record," which is also destroyed at the time of the next review. For statistical purposes a copy is preserved without name. The intention is not to maintain in the personnel record of the employee any adverse opinions against him.

(6) For each department, region or district, the conclusions of the Career Planning Board are assembled on a "Target Position Recommendation Chart", which correlates jobs to employees in each section, provides an annual inventory of the Commission Staff, and contains the data required for future manpower planning. The chart indicates:

a) Employees who are now on target.
b) Employees who are now ready for advancement.
c) Employees who may be ready for advancement later.
d) Employees who should be trasferred, demoted, etc.

For each employee, his "immediate target" and his "long-range target" are determined. By the word "target" is meant the position to which an employee is progressing. It is usually a higher position but it may be the position he holds if he lacks the complete mastery of the skill and knowledge required of him in that post.

The Board does not guarantee advancement or payment of higher wage or creation of more jobs, but under the plan, every employee gets a chance to satisfy his natural desire to improve and advance himself to the limit of his abilities, consistent with the opportunities available.

(7) The Career Planing Board may recommend for the self-development of an employee one of the many instruction courses sponsored by the organization, an appropriate correspondence course, a night school, special study of a subject, issue of any particular literature to him, his placement at a different place or under a different supervisor, etc. The recommendations of the Board in respect of employee-training ar communicated to the Personnel Training Division, where the training of the employee is planned in consultation with the line organization. In addition to affording facilities in their own organization for training, the Personnel Training Division maintain a close laison between their employees and such training institutions as provide courses appropriate to the needs of the organization. When an outside course of training is recommended by the organization, the expenses thereof are either partially or wholly reimbursed by the organization to the employee on the successful completion of the course.

Performance Review & Development Record.

The standard from varies slightly for different types of jobs. Specific qualities associated with particular positions are reviewed under appropriate headings. The individual performance is not related to any

personal or ideal standard but is measured against what is normally expected of a person of a similar age, service and experience placed in the same circumstances. Generally speaking, the employee's performance is assessed with respect to:

a) His health—the physical stamina manifested in the capacity to work every day, all day and, if necessary, during overtime periods without evident slow down or fatigue; the mental activity as shown by his reasoning and analytical ability and the breadth, depth and clarity in the perception of ideas.

b) His technical performance—the "how" and the "why" aspects of his work, or the application of theory to practice in controlling difficult situations and solving complicated problems.

c) His job performance—degree of effectiveness and proficiency, the quality and the quantity of work, in the discharge of his everyday duties.

d) His personal relations—the confidence and respect he wins from his supervisors, from those of the same ranks, from those of a lower rank, from other departments and from public relations.

e) His state of development and performance—the overall position of an individual in relation to his job. It includes his health, skill and knowledge of the particular branch of his profession, his job performance, his relations with others and the amount of supervision he requires.

The employee's personal development is reviewed with respect to the following:

a) Steps taken for the development of the employee during the last 12 months.

b) Future prospects—½ career routes recommended for the employee, his immediate and long-range targets and suitable placements.

c) Training courses recommended for the next 12 months—steps to be taken by the employee, by his supervisor and by the Commission.

d) Other recommendations—transfers, etc.

The employee's performance is indicated by "degrees", which are as expresed *low*, *average minus*, *average*, *average plus* or *high*.

Though these words mean what is normally understood by the expressions, an attempt is made to lay down definitions of these words for specific application to the various items under "Performance Review."

An employee, who has completely mastered all phases of his official position combined with good personal relations and who is very often scheduled to assume responsibility for a position of higher rank, is placed in the "Key Man Stage." No matter how much time an employee spends in the higher ranking position he cannot be placed in the Key Man Stage if he lacks all-round skill and knowledge in his regular position or if his personal relations are below average. The man placed in the Key Man Stage would, on

account of his ripe experience, in addition to carrying on his normal duties and responsibilities, be capable of performing extra functions which may include developing and training other individuals in the work of the same type, providing exceptional leadership to others, suggesting improvements and other useful and creative activities outside the normal content or expectation of the job.

When a person is recommended for placement in a different position, his stage of development in the recommended position is also determined. The stage of development of an employee in his regular position may be high but it may be low in the recommended position. He may act the qualities of leadership or may require specific training for the recommended position before he is able to satisfactorily discharge the duties and responsibilities of his new position.

Essential Features.

Before any scheme of planned appraisal of the abilities of the employees of an organization can be introduced, it is essential for the management to lay down specifically the job requirements and position specifications or, in other words, to let each employee know what is expected of him in a particular position and to have an acceptable "yardstick" or standard to compare his job performance with. In the commission the grades of pay are related to job specifications and any employee who feels that he has been placed in a grade lower than what his qualifications and duties with respect to his job requirements warrant, has a right to apply for a re-appraisal and upgrading of his value and a definite procedure is laid down for the disposal of such applications.

The immediate supervisor of an employee is chosen as the starting-point in Career Planning. By reason of his close contact the supervisor has the clearest picture of the nature of the employee's work, the standards for the job, and the employee's performance in the job. Each supervisor is expected to conduct his relations with his men on such a high standard of fairness and sympathetic understanding that every employee under him will naturally feel that his own supervisor is the one person who can do the most to help him get ahead. Loyalty of employees depends on their confidence in their supervisor's ability to guide them to success, in his absolute honesty and fairness, and more in his willingness to share the praise and commendation he receives with those who helped him to success. It is only by the joint effort of employees and their supervisors that the best use of the employee's talents can be achieved.

The success of the Career Planning Scheme depends on the active participation of the employee himself in his own appraisal and the suggested courses of development. An atmosphere of mutual confidence is, therefore, considered essential. Employees and their supervisors may see things differently and at times an employee may feel that his supervisors are not making a fair appraisal of his performance and abilities. In

such cases he is encouraged to make out a "Performance Review & Development Record" form for himself. The supervisor and the employee then discuss the employee's performance on a point to point basis. Should they still not see eye-to-eye, the employee's form is sent on with that of the supervisor to the Career Planning Board for consideration. Each employee generally exhibits a keen interest and desires to play his part in his own development and training. He is anxious to know the Career Plannig Board's recommendations for him and the information is supplied to him immediately after the Board's deliberations are concluded. He is told what career routes are open to him—what efforts would be required and what benefits are likely to come from each. No one knows better than the employee what his innermost ambitions are and all efforts of his supervisors will be lost if the employee is in disagreement with their plans.

Maintenance of "Black Books" or adverse remarks against employees is conspicuous by its absence in the Commission. Adverse remarks rarely produce the desired effect, On the other hand, the psychological effect of the practice is resentment, which is destructive rather than constructive. Career Planning is based on the fundamental principle that if a person is in sound health and is not distracted by outside influences, he is fit to hold a job if placed in the right place; the latter is the responsibility of an organization to do if it wants to get the maximum service from its employees. As a general rule every employee tries to satisfy his boss. This is true of the attendant as well as the highest executive officer of an organization. But how many employees do know what the boss really wants and how many bosses do have a clear conception of what their assistants lack? The Career Planning Scheme affords opportunities both to the employees and their supervisors to know each other better and overcome preferences and prejudices by a free and frank discussion.

Achievements.

The Career Planning Scheme is looked upon by most of the employees of the Commission as a self-development plan, though it incidentally does provide useful information to the management on which to base their manpower planning policies. No monetary loss or gain accrues to the individual as a direct result of the employee's performance review under the plan. The Commission use the plan in various ways, some of which are:

a) Make the individual feel he is a valued part of the organization and to provide an opportunity to give credit where it is due and constructive suggestions where help is needed.

b) Measure the effectiveness of the organization and to make plans for its future development.

c) Permit the development of training programmes based on known needs.

d) Produce a factual personnel record which will minimize reliance on impressions which

may be affected by prejudice or other factors.

e) Avoid recourse to seniority as the sole determinate for promotion, tansfer, lay-offs, re-hiring, etc.

f) Create better personal understanding and consequently better operating relations as well as improved job knowledge.

g) Provide a basis for more effective personnel administration.

Seniority is not the only criterion for promotion to higher posts in the Commission. Suitability of the person for the higher post as indicated by his displayed and appraised capabilities is one of the main considerations on which decisions are based. Except for high excutive posts, no person specialized, say in transmission line work, would get transferred for the purpose of promotion to a post carrying a higher salary in the generation or the hydraulic department, wherein experience in a different field is necessary for efficient discharge of duties, no matter how many persons junior to him in service are promoted to higher posts in the latter departments. Such transfers would not be in keeping with the established policy of the Commission that an employee must be placed in a post best suited to him where he could be of maximum service to the Commission. However, in a big organization like the Hydro-electric Power Commission of Ontario, no employee who is conscientious and is desirous of self-development, stagnates in the branch in which he starts his career.

Applicability to India.

A number of organization in the western countries have evolved plans of their own for performance appraisal and self-development of their working force. In India, the employee appraisal is based in almost all cases on the confidential report of a few top executives and the individual employee has to depend on the casual appreciative gestures or deprecatory remarks of his supervisors to judge his value to the organization he serves. Inefficiency is attributed very often by the person adversely affected to the sectarian feelings, group attachments or personal prejudices of his superior officers. Self-deficiency as the possible cause of in-effectiveness rarely enters his imagination.

Our country is passing through a critical period of transition in her industrial economy. The increase in the cost of living in recent years has been out of all proportion to the earning power of the common man. The wages in India, both for skilled and unskilled labour, are lower than those of their counterparts in the western countries but still the cost of production in India is higher. What are the causes? Though it is commonly believed that this is entirely due to a greater mechanization of industry and adoption of mass production methods in the western countries, the lack of initiative in the Indian worker and absence of facilities for self-development afforded to him by the industry are in no smaller degree responsible for his lowered efficiency and, therefore, for higher cost of Indian products. Over-mechanization and centralization of industry for the adoption of mass production methods have their disadvantages and may not be practised in India to the same extent as have been done in the western countries. But nothing can be lost by the adoption of modern technique in the formulation of personnel policies with a view to bringing about a radical change in the employee-management relationship not only for the benefit of both but also in the national interest of the country.

THE PROBLEM OF MILK SUPPLY

By
Sri. H. L. JAGANATH, L. Ag., I. D. D., M. Sc., (U. S. A.)

THE milk supply in our rapidly growing urban areas has always been woefully inadequate. It is practically impossible for the average household to get wholesome clean milk. The overall picture of the city milk supply in India is a gloomy one and it will take a long time to improve the situation. The increased production and organised distribution of milk in cities on a large scale centres around the rural people who are after all the major producers and suppliers of milk and milk products. Active co-operation of these people is very necessary in any plan to get and distribute milk in the cities. This problem is a very complex one involving fundamental changes of outlook and agricultural practices in the farming communities. The kind of organisation which could help make the rural folk interested in such a plan is essentially a co-operative one. The formation of a Co-operative Milk Supply Union, therefore, with the producers and interested parties as members is the first essential step.

A city gets its milk through two main sources; the city milk-men who keep their cattle in the city itself, and the surrounding villages from which milk is transported to the city on bicycles and carts. There may be also a few dairies who act as distributing centres for some of the village milk. There is no check on the production side at all. It is needless to mention that the quality of milk is far from desirable. The consumer has little to say in the matter nor can he complain because mostly there is nobody to complain to except the milk-man who is the producer who may stop his milk supply.

I. Organisation.

1. The Union run by a suitable board of control representing producers, consumers, Co-operative and Animal Husbandry Departments and Corporation.

2. Formation of subsidiary village societies, sub-depots and milking yards for collection of milk.

3. Opening food depots for supply of cattle feed to members.

4. Provision of veterinary aid, dry farm facilities help getting good milk cattle and bulls to members etc.

5. Well trained technical staff to supervise and help the producers in proper management, breeding and feeding of cattle, clean milk production, run the union efficiently etc.

II. Operation.

A. General.

1. Attempt to be made to handle initially a minimum of 2,000 lbs. of milk daily at the central depot.

2. Installation of cooling plant to cool the milk (precooled by cold water at the collection depots) and keep it at 45-45 °F.

3. Purchase of motor van for collection of milk from depots.

4. Distributing milk to consumers morning and evening by means of cycles, horse-carts and vans if feasible.

B. Production of Milk.

In the cities:

1. All milk-men in the cities to be licensed for enforcing quality control.

2. The milk-men encouraged to become members and realise the advantages of doing so.

3. Common milking yards, with cold water tanks to cool the milk immediately, constructed at suitable places for them to bring their cows and milk under proper supervision.

In the rural areas:

1. The milk producing area to be within a radius of 25-30 miles for reasonably easy and quick collection and despatch to the central dairy by van.

2. The milk producers licensed here also.

3. Construction of community milking yards with a milk room and cold water cooling tank.

4. Formation of collection depots at suitable places for quick haulage of milk to central depot.

III. Central Dairy.

1. A pukka building located in a central place with facilities for clean water supply, electricity and good drainage.

2. Constructed suitably for receiving, storing and despatch of milk for office and miscellaneous stores.

3. A small laboratory for testing quality of milk.

4. Maintaining necessary records for handling milk.

IV. Personnel.

In addition to the routine staff of Dairy Manager, Supervisors, Accountant, Dairy boys etc., it is imperative that the following personnel are included in the organisation.

1. *An Executive* technically qualified (with suitable designation perhaps as the Secretary of the board of directors) who is responsible to the board for the efficient management of the different units of the co-operative.

His duties would include:

a) Administration of the central dairy and its different units.

b) Extension work (rural development) in connection with the promotion of dairy development such as formation of Rural Clubs, 4-W Clubs, Farmers Institutes etc., and teaching them better methods of management, co-operation and thus bringing in more members.

c) Playing an important part in the continued expansion of the co-operative by constant contact with the producers.

2. *Fieldmen* are absolutely necessary to keep in constant and continuous contact with the producers and thus help promote more good-will, better and increased milk supply. Help the farmers to better manage, feed and breed their cattle; actively help in the extension work; recruit more members etc.

3. Health Inspectors to keep check on the sanitary conditions of the milking yards, health of animals etc.

FOOD FROM THE SEA

By
GORDON A. RILEY

NO one need to be told that there is a great deal of life in the sea. Sweep the shallows with a fish net, explore the deeps in a diving bell, dip up but a cupful of ocean and examine it under the microscope—at every level, the watery world swarms with a rich and varied population. But only recently have land inhabitants begun to understand just how vast this population is. Even fragmentary efforts to take a census of it indicate that the life of the sea actually surpasses that of the land.

Man has hitherto taken his food almost entirely from the land; less than one per cent of what he eats comes from the sea. We would like to believe that in the immense, newly explored organic resources of the oceans lies at least part of the solution to the world's increasingly acute food problem. At this moment, however, no one can accurately assess the potential marine food resources. Large areas of the oceans are still relatively unexplored from the biological point of view. A recent international conference of fisheries experts called attention to the fact that increased fishing effort on the major fishing grounds of the North Atlantic had not increased the catch; indeed, some biologists believe that these grounds are now being overfished. Moreover, there are technological problems and unpredictable economic factors that will have an important bearing on how much food we can feasibly get from the oceans. Yet, with all these cautious reservations, we are justified in taking a hopeful attitude toward the possibilities.

The hierarchy of life in the marine world, like that in the terrestrial world, is founded on green plants. They alone have the ability to convert inorganic materials into living substance and, directly or indirectly, they support the whole animal population. This system by which organic matter is created by the photosynthesis of green plants, consumed and broken down by animals, and recreated by plants is essential to the continued existence of any population, on land or in the sea.

At the base of the oceanic hierarchy is a vast mass of organisms so tiny that they are individually invisible. More than 99 per cent of the marine plants are microscopic, one-celled algae which have a precarious and nomadic existence. They are suspended in the surface waters of the sea and drift idly with the currents. To the naked eye, they are visible only as a greenish or brownish tinge in waters where they are abundant. Under the microscope, they are resolved into great multitudes of organisms, ranging from a thousand to several million in a quart of sea water. They add up to a total of perhaps a hundred pounds of plant organic matter for each acre of ocean.

Associated with the plants is a great variety of small animals.

Some spend their whole lives drifting in the surface waters. Others stay with the floating population only until they are grown and then strike off on their own. Not all the animals in this population are plant-eaters, however, some prey on smaller animals.

The floating plant and animal society is known collectively as plankton. It provides food for a host of larger and more active creatures that live in the surface waters, including such fish as herring and mackerel. In coastal waters and the offshore fishing banks, plankton sinking from the surface nourish the small animals that live on or near the bottom. These, in turn, are the food of flounders and other ground fish.

Thus, the fishes and other large animals in the sea represent the end product of a long and complicated food chain. Through a series of predations, the tiny bits of plant life are transformed into successively bigger bundles of living material. But all along the way from plants to fishes, there is a continual loss of organic matter. During its growth to adulthood, an animal eats many times its own weight in food. Most of the organic material it consumes is broken down to supply energy for its activity and life processes in general. It follows that the total of plant matter in the sea outweighs the animals that feed upon it, and the herbivores in turn outweigh the carnivores. Fish production is believed to be of the order of only one-tenth of one per cent of plant production.

The investigation of the amount of organic production in the sea is one of the most difficult and fascinating problems in biological oceanography. In the broadest sense, it means determining the rate of production at every level in the food chain. It also means investigating the tangled oceanographic and biological relationships that determine the productivity of any given region.

The Norwegian investigator, H. H. Gran, filled bottles with sea-water containing its natural plankton population, suspended them in the sea, so that they would be exposed to reasonably normal conditions of light and temperature, and measured the growth of plankton that occurred during a period of a day or two. To measure the production of organic matter, he divided the bottles into two groups. One group he wrapped in dark cloth, by excluding light, he prevented the process of photosynthesis, and, in these bottles, the plankton did not produce organic matter but only consumed it. In the lighted bottles, on the other hand, both production and consumption went on, just as in the sea. The difference in the organic content of the two sets of bottles showed the total amount of organic production.

Several hundred such experiments have now been made by Steeman Nielsen in Danish waters, by the writer in the western Atlantic, by M. C. Sargent of the Scripps Institution of Oceanography in California coastal waters and the tropical Pacific, and by others. In most of the regions examined, the sea yields from one to three tons of dry organic matter an acre every year. This

means that, on the average, the plant population must grow about 10 per cent a day. The most fertile areas of the ocean have approximately the same annual production as a forest. The lower limits of productivity correspond more nearly to the grass crop of a semiarid plain. Thus acre for acre, the plant production of the sea and of the land is of the same order of magnitude. But, because of the larger area of the sea, its total production is almost certainly greater.

The production of animal plankton has not been studied as thoroughly. The animal crop is from one-tenth to one-half of the plant crop. But the animal production cannot yet be estimated with a satisfactory degree of accuracy.

Fish and other animals at high levels of the food chain have a much slower growth rate than plankton. Several years ago, Daniel Merriman and his associates on the staff of the Bingham Oceanographic Laboratory of Yale University in the United States began an intensive study of the flounder fishery off the southern New England coast. According to their findings, annual production of fish approximately equals the population at any one time. The average plant population in the area studied appears to be about four times the weight of the fish. But it grows much faster; the annual plant production is over 500 times the annual fish catch. Similarly, the Woods Hole Oceanographic Institution and the U. S. Fish and Wildlife Service found that on Georges Bank, a large and important fishing area east of New England, annual fish landings ranged from 7 to 33 pounds an acre, while phyto-plankton production was estimated to be of the order of a thousand times the maximum commercial catch.

These studies of marine productivity are a step along the way towards two goals that oceanographers have in mind. One is purely scientific—to gain an understanding to the principles that govern the existence and growth of marine plants and animals. The other is to apply this knowledge, wherever possible, to practical affairs.

What are the factors that control the sea's productivity? In a general way, we know some of them. We know that light and temperature strongly affect the growth rate of the plants, and temperature also influences the rate at which these plants sink to deeper levels and the rate at which animals feed on them. Currents and accompanying turbulence in the water are important: if the turbulence is too great, it slaughters the surface population by carrying plants down below the zone of active growth; if the turbulence is too weak, the population again suffers because less phosphate and other food is brought up from below.

The best fishing areas are generally in shallow water. There the plant population is concentrated in a small space, and the animal plankton can feed intensively and grow rapidly. There, also, an abundant supply of plankton falls to the bottom and nourishes the animals that live there. In deeper waters, the dead plankton decomposes as it sinks, and little reaches the bottom. This is

one reason why on a deep ocean bottom animal life is scanty.

During the past few years, the writer and his associates have made preliminary attempts to deal with plankton in mathematical terms. An equation can be written to predict the quantity of plankton in a given region or its seasonal changes on the basis of the environmental characteristics of the region–light, temperature, turbulence, the depth of water, and the deep-water concentration of nutrients. Unfortunately, present knowledge of these subjects is not nearly as precise and complete as might be desired. Nevertheless, in various regions where the equations have been applied, the quantities of plankton predicted agree with observations within about 25 per cent.

Predictions of one kind or another will be a major function of the practical oceanographer of the future. It will be necessary also to consider controls to prevent overfishing, which endangers the production of young. Even when we have solved the problems of fish conservation, however, there will remain the challenging fact that we still will be using only a tiny fraction of the total organic production of the sea.

One way to increase our harvest is by intensive oyster and clam farming. These animals exist at a low level in the food chain, living on small plankton and detritus. Production is, therefore, relatively efficient. In the Philippines, the East Indies, China and various other regions, considerable success has been attained in farming fishes and prawns. When shallow coastal areas are impounded and artificially fertilized, the increase in production is sometimes twenty-fold. Annual yields of 4,000 pounds of fish an acre have been reported. Development and extension of fish culture in both marine and fresh waters is undoubtedly one of the best approaches toward remedying the protein deficiency of the Oriental diet.

We can certainly learn to use fish more effectively and catch them farther afield. There are vast fishery resources in various parts of the world that remain virtually untapped. Changing economic patters and increased demand may lead to the development of such resources. Quite possibly, the world's fish catch could be increased at least five or ten times.

INDIAN SOAP INDUSTRY

SOAP manufacturing is one of the important industries of India and Indian Soap Manufacturers are producing some of the best soaps which in matter of quality can stand comparison to foreign soaps. From a small beginning of an annual production of 22,000 tons in 1918, its capacity is increased to 2,69,000 tons in 1950.

The first modern soap factory was established in India in 1879. There are at present 120 factories apart from numerous small establishments all over the country. The industry is localised mainly in the states of Bombay, Calcutta, Madras, Uttar Pradesh, Madhya Pradesh, Hyderabad and Mysore of the total annual production of 2,50,000 tons in 1948, it is estimated that 30% is utilised by large scale units, 40% by small scale units and 30% by cottage industries.

The following table is revealing:—

Year	Production	Imports	Exports
1939	70,000 tons	33,238 cwts.	Nil
1944	1,40,000 „	...	...
1947	80,000 „	10,345 cwts.	26,009 cwts.
1948	1,90,000 „	3,661 „	52,308 „
1949	74,800 „	...	...
1950	one-half 65,000 „ 1949—50	2,852 cwts.	27,182 cwts.

The first modern soap factory in India was set up by the North-West Soap Company in Meerut in 1879. Shortly after the same firm established another factory in Calcutta which is now under the management of Messrs. Lever Brothers. By 1913–14 the production of soap in India was 14,000 tons per annum. The First World War and the movement started in 1920 to encourage the use of Indian made goods gave impetus to the soap industry. The Kerala Soap Institute at Calicut and the Mysore Soap Factory at Bangalore, were two more attempts made at manufacture of soap, this time under Government auspices. It was not, however, till the late nineteen-twenties that the first big soap factory was established by private enterprise, the House of Tata's in Cochin. Another agitation for the use of Indian goods in 1930 gave a further fillip to the development of the Indian soap industry, and an attempt was made to organise the industry on an All-India basis, by the formation of the All-India Soap Makers' Association at Calcutta.

In the early thirties, Messrs. Lever Brothers established the largest soap factory in India, and the production increased to 43,000 tons per annum. This affected India's import trade in soap which stood at £1. 5m. in 1920–21 and which fell to £1. 2m. in 1929–30, and further

decreased to £58 m. in 1933-34. This trend continued till 1939 when production rose to 70,000 tons per annum, and imports fell to £21m. By this date, India was able to manufacture high class soaps of all varieties and plants for recovery and distillation of glycerine were installed in four factories.

World War II gave a further push to the industry, in common with many others, and in 1944 production of soap rose to 1,40,000 tons of which 10% was reckoned to be milled toilet soap. It may, however, be mentioned that except for a few well established factories, production is mainly carried on in a large number of small establishments spread all over the country, as there are only 120 factories registered under the Factories Act.

Raw Materials Required.

Oils and fats form the most important raw materials, as over 60% of any genuine soap consists of fatty acids. Other materials consist of resin, alkalis, common salts, fillers, essential oils and aromatic chemicals and colours.

The present production capacity of the soap industry is 2,69,000 tons. In the Government of India's Soap Panel report, a five-year target for development of the soap industry was fixed at a minimum of 3,00,000 tons, and according to the same source, in order to reach this production, the requirements of oils of various types were stated as follows:

1. 61,000 tons of hard oils.
2. 51,000 tons of soap stock (equivalent of fatty acids) expected to be obtained from 4,00,000 tons of hydrogenated oils.
3. 50,000 tons of coconut or palm kernel oil.

1,82,500 tons.

Most of the requirements of these oils are met from indigeneous production, except coconut oil, which is imported mainly from Ceylon. Since the end of the last World War, the question of high prices and comparative shortages of these raw materials has been hampering the progress of the industry, and this is specially true in the case of coconut oil. Before the war, coconut oil used to cost of £15 to £19 per ton, and now costs between £172 to £180 per ton. This development has also affected the export trade in soap. In 1948–49 India exported 52,306 cwts. of soap. In the following year, 1949–50, however, exports fell considerably.

Apart from the question of price increase, the demand for oil from other industry exceeds the indigenous supply estimated between 50,000 to 1,00,000 tons. It is in this connection that a move was made by the soap industry to the Central Government to abolish import duty on oils and relax import control of oil from soft currency areas.

As regards resin, there are three factories in India producing resins of the desired quality, and its wider use in the manufacture of soaps, particularly laundry soap, would certainly serve to economise the use of oils and fats in the country.

A few years ago, the entire requirements of caustic soda for soap and other industries were imported, principally from U. K. Efforts are now being made to produce caustic soda in India. During 1950, for example, 8,090 tons were produced; but in view of the present capacity of the soap industry, which may consume as much as 45,000 tons of 96/98% caustic soda, including a small quantity of caustic potash, imports of these articles will have to continue.

Working at full capacity, the industry may require 20,000 tons of salt of no less than 90% purity, although actual consumption may be much less, since cold processed soap requires no salt. Semi-boiled processed soap a small proportion of it, and factories having glycerine recovery plants require still smaller quantities. These requirements could be met from indegenous production as India produced 5,79,74,000 lbs. of salt in 1950.

At present, soap-stone, which is a cheap material, is being used in appreciable quantities as a filler. Although the Standards Institute may lay down the amount of fillers that could be used in various types of soaps, the Indian industry will find no difficulty in obtaining the supply of necessary quantities of fillers from indigenous sources.

Present Position.

It is extremely difficult to state the number of people and the capital employed in the industry, as quite a large proportion of manufacturing is done on a small scale basis. Roughly speaking, 30% of the total capacity is utilised by the plants of Lever Bros., and Tata's, 40% by small scale units, and the remaining by cottage industries.

It should, however, be remembered that India has her own indigenous cleansing agents of vegetable origin detergents such as 'Aritha', or soapnuts, wood-ash 'Sikakai,' gram flour, etc., and Saponaceous clays found in river beds and elsewhere. Some of these are in extensive use even now, and form an aid to personal hygiene. The main problems facing the industry were brought to the notice of the Government in 1950.

At the request of the Soap Industry in India, the Indian Standards Institution has developed two draft Indian Standards specifications for laundry soaps and for toilet soaps. The draft Indian Standard for laundry soap describes the requirements for three grades of washing soap in respect of fatty acid contents, free alkali, moisture, chlorides, etc. The draft Indian standard for toilet soap lays down the essential requirements for fatty acid contents, free and combined alkali and chloride. In both the standards the method of marking sampling and testing are also included. These drafts have been circulated to members of the institution interested in this field and to large consumers, manufacturers and technologists concerned.

IMPROVING TOMATOES

By WILLIAM GILMAN

(From NATURE MAGAZINE)

THE ordinary gardener is inclined to take the tomato, symbol of juicy garden freshness for granted. Actually, the tomato has had a difficult time. Like the potato, it was originally without honor in its native hemisphere. Both originated in the New World; both had to go to Europe and win popularity there, before returning across the Atlantic to become standard American foods. As recently as a century ago, the tomato was still an object of suspicion. Some called it the "love apple", and wanted no part of it. Others considered it poisonous.

Glance through the pages of any present-day American seed catalog, and it is obvious how far the tomato has come. But not far enough, in the belief of Dr. Yeager, who heads the Horticulture Department of the University of New Hampshire. Here for 11 years, and during 20 preceding years while he was experimenting at state agriculture colleges of North Dakota, Pennsylvania and Michigan, he has been pursuing the perfect variety.

Much of this research has been aimed at making the tomato better adapted to short growing seasons in the cold northern states. In this, Dr. Yeager has been a good example of the scientist who will not be easily satisfied. At North Dakota Agricultural College, when he gave the Great Plains states their quick-maturing, hardy Bison variety, he thought he would drop tomato work. But he could not, and went on to put the Victor variety into seed catalogs. It was an All-American prize-winner, and remains a standard among earliest tomatoes.

But Dr. Yeager could not be satisfied with these honors. His latest favorite is a new variety for which he wished somebody would donate an appropriate name. Its fruit is not only larger than Victor; it ripens a week or more earlier.

"Some people raise tomatoes," another horticulturist once said: "Yeager races them."

But ripening speed is not all. Another highly important project is to raise tomatoes full of Vitamin C, and thereby make them rival oranges as a mealtime juice. Thanks to help from a grape-sized Peruvian tomato, Dr. Yeager already has normal-looking varieties containing two and three times as much of this precious vitamin as do ordinary tomatoes. All this, obviously, is plant breeding with a purpose, to provide healthier, more appetizing menus for the northerner, whose garden and orchard must face spring's late frosts and autumn's early ones.

Tomatoes are only one example of both the motive and method. Yeager originated the now-standard Buttercup variety of squash to give northerners a meal-sized type equivalent in nutrition, Vitamin A, and

cooking methods to the sweet potato of the American South. From there, he has gone on to produce Bush Buttercup and most recently, Baby Bule, a cross between Bush Buttercup and Blue Hubbard. It sets its meal-sized squash at the vine's stem, instead of first taking time to grow ten or twelve feet before producing female blossoms. And his "perfect flowering" muskmelons, with self-pollinating blossoms possessing both pistils and stamens, similarly shorten the time required for ripening fruit.

When Dr. Yeager went to New Hampshire in 1938, a farmer answered a question with the reply, "Yes, we can raise melons, but they are not fit to eat." The horticulturist went to work to cure that situation. Eight years later, he introduced Granite State, a firm, excellent-tasting muskmelon that grows fast enough for the short summers in the northeastern section of the United States. In 1949, he produced a watermelon that ripens more quickly than his muskmelons—and promptly set out to get a muskmelon that would beat the watermelon.

Much of this breeding has incorporated Dr. Yeager's favorite strategy—less vine or foliage, smaller but quicker fruit. An extreme example is the New Hampshire Midget, the cantaloupe-sized watermelon that ripens around 65 days from seed. It is large enough for two servings. In modern days of crowded refrigerators and small families, this convenient size is a virtue.

In his many projects Dr. Yeager is helped by graduate students who soon catch his infectious enthusiasm and dovetail his work with that of talented colleagues. Dr. Yeager's new associated is E. M. Meader, who was a horticulturist with the U. S. Army in Korea and brought back 150 varieties of shrubs. Vegetables and fruits, many of which had never been seen before in the United States.

Most of the research follows the pattern that has governed Dr. Yeager's career. As he puts it: "We search for the best varieties that exist and then, if possible, improve them." With co-operation from the U. S. Department of Agriculture's plant explorers, Dr. Yeager is able to search all over the world—Turkey, Siberia, Japan, India, South America —for the seeds and cuttings he wants to try in breeding work.

It takes time, sometimes years of patient crossbreeding and selection, for worthwhile results, but Dr. Yeager has tricks of the trade that often reduce labor considerably. In tomato work, for instance, he cuts time one-third by raising three crops a year—two under glass and one outdoors. Even before a peach pit has sprouted, he can examine its interior and decide whether he wants the colour of the fruit that the tree would produce. From first leaves put out by a seedling, he can tell what color its beans or grapes will be.

When he went to New Hampshire, he astonished a green house laborer by sprouting 1,000 tomato seedlings, then throwing away 997 of the plants, keeping only three at blossoming time. He had discovered a way to save blossoms and growing

space, keeping only the plants that would bear large enough fruit. By glacing at the blossom's embryo, and multiplying this diameter by 20, he knew what size the ripe fruit would be.

At the end, it is the public that judges whether a new tomato will be a success or not. For instance, Dr. Yeager points out, there is little interest in a tomato that is not red. Yellow ones are still unusual and pink ones distinctly unpopular. Actually, he explains, red and pink varieties are brothers under the skin. The pink tomato's pinkness is due to a transparent skin.

Dr. Yeager's big work concerns earlier and higher-vitamin tomatoes. He got extreme earliness by pioneering with "determinate" varieties, of which the Victor is the best-known example. Here, again, is the principle of reducing useless foliage growth. Such varieties "prune themselves". They behave like true annuals, reaching a certain height, and then stopping growth. As a result, they bear fruit earlier and lack sprawling habits, they do not need staking. The work with high-Vitamin tomatoes not only has looming economic importance, but illustrates the large amount of patient breeding that can accumulate in the background before a new variety reaches its debut. Many crossings result in what Dr. Yeager calls his "mules"—hybrids that do not reproduce,

In the past the American Medical Association has classed tomato juice far below orange juice in Vitamin C content. This is the Vitamin known chemically as ascorbic acid, and is vital to health. After 11 years, Yeager has now created tomatoes with Vitamin C content that rivals that of citrus fruits, and is retained in the canned product. Amount of sunlight produces variations, but, in general, standard tomatoes contain around 20 milligrams of this vitamin per 100 grams. The new varieties run up to three times this amount, and have even reached 80 milligrams of Vitamin C per 100 grams.

This Vitamin pioneering began in 1938, shortly after Dr. Yeager went to New Hampshire. It started by crossing a greenhouse variety with a wild tomato from Peru. The latter was a sweet, greenish-white fruit only one inch in diameter. But Dr. Yeager knew that this grape-like variety's Vitamin C content was four times that of ordinary tomatoes. From several hundred matings, many fruits were set. But the sum total of all that work was only one solitary hybrid seed. It was this lone freak that Dr. Yeager planted nervously. Luckily, it was fertile, and it produced enough fruit for a sizable second generation. This enabled the long job of more crossings and selection of best progeny to get under way. Gradually, Dr. Yeager built size, quality, and color into the newcomers.

In 1948, he was ready with his first introduction. It is called High C. In addition to the vitamin feature, it has determinate growth for early ripening. It is round, red, very firm but somewhat small—about five fruits to the pound. Highly productive in an average growing season, its Vitamin C content runs roughly double that of standards like Victor

and Marglobe. In 1949, Yeager finished work on a variety he is calling New Hampshire No. 50 until a good name is found. This indeterminate variety is later ripening than High C, but superior in other respects. Along with increased size, its Vitamin C content approaches three times normal.

Dr. Yeager predicts that such tomatoes will become standard varieties within ten years. Along with such serious work, however, he finds time for novelties. One originated in a project undertaken by a class in plant breeding. The idea was to see how small a tomato plant could be produced that would mature fruit. A cross was made between Windowbox and Red Currant. This variety produces cherry-sized tomatoes nicely while growing in a three and one-half inch flower pot. Yeager does not like to have an unusual variety go to waste. Looking at the new tomato, he wondered if it might not have value as an ornamental for Christmas decorations. This time, he had no difficulty in thinking up a name. It is called Tiny Tim after the little boy in the beloved story "A Christmas Carol" by the English author Charles Dickens.

Adulteration of Buffalo Milk.

Methods for checking the extent of adulteration made in buffalo milk by addition of cheap skim milk powder have been evolved in the Indian Dairy Research Institute, Bangalore. Cheap skim milk powders are being used in the country feely as adulterants to tone up buffalo milk so that the latter could be sold as genuine cow milk. From a nutritional point of view, such toning, if done carefully to conform to the legal standard regarding fat percentage in milk, is not objectionable, although the mixture cannot be regarded as genuine milk. Simple tests to suit household conditions for checking such adulteration have been devised. Some of these are: (a) Toned milk after incubation for four hours at 37°C emits a very characteristic edour, (b) Toned milk takes longer than genuine milk to coagulate when treated with rennet.

Cream-Ghee.

The Institute has also devised a process for producing ghee from cream-a practice which is now-a-days replacing the system of producing ghee from butter. The present method of preparing ghee out of cream consumes more fuel and time and leaves a large quantity of fat in ghee residue. The ghee produced also does not possess that natural rich aroma, characteristic of ghee produced from butter. On the other hand, cream-ghee has been found to possess better keeping qualities and certain other advantages. The Institute is now investigating into processes by which the limitations of the method of producing cream ghee can be removed and its advantages retained. Investigations so far undertaken indicate that the excessive quantity of non-fatty solids can be reduced by washing the cream. This process consists of diluting the cream with water and then passing it through the separators. This also appreciably increases the percentage yield of ghee. Aroma can be imparted if before clarification the washed cream is ripened to an acidity of 0·16 per cent. The acidity or ripening helps in increasing the yield of ghee by 2 to 3 per cent without affecting its storage quality.

FACTS THAT INTEREST

Undisturbed soil density found with radioisotopes.

Densities of undisturbed soils are being determined by means of radioactive isotypes at Rutgers University.

In a research project sponsored jointly by the university's college of engineering, New Jersey's State Highway Department and the Bureau of Public Roads, a radiation source and a radiation meter are being used to measure densities—as variations in gamma-ray transmission-through soil samples from 6 to 50 in. thick.

Cobalt-60 is the radioactive element used—18.5 millicuries of it. A 50% change in transmissibility has been recorded between loose and compacted materials, regardless of soil sample thickness.

Rutgers researches plan to continue their studies, drilling vertical holes for insertion of radiation source and meter, to gain experience. They feel reading of the radiation counter should make it possible to determine whether or not the soil on a given construction project site could be compacted. Soil density changes due to temporary loads, frost action or temperature changes should be measure able, it is felt. The effect of successive passes of rollers—particularly referring to death of compaction—will be sought.

Simplicity of the method is stressed: ease of drilling holes to any Dept. inexpensive and portable instrumentation, and instantaneous indication of results. Its effectiveness on undisturbed samples is the method's chief asset.

Experiments have been made in ray-proof laboratories by professors J. J. Slade and R. K. Bernhard, in cooperation with the Agricultural Experiment Station of the university.

Did iodide bring Snow ?

A deluge of early spring snow has piled up on three major Colorado watersheds where silver iodide generators of the Water Resources Development Corp. have been in action this winter. The snowpack in the three areas (the headwaters of the Colorado, South Platte and Arkansas Rivers) is now 20 to 50% above normal.

The professional rainmakers claim credit for this. They point to subnormal snowfall so far this year in mountain areas where they have not been operating, and the drought of last fall to reinforce their claims.

Fire-resistant Roof construction for Row Houses.

A method of constructing continuous fire-retardant roof decks that span two or more row houses separated by 2-hr. masonry walls has been developed by the Engineering Committee of the Asphalt Roofing Industry Bureau, and approved by the Department of Public Works of the City of Baltimore, Md.

Advantages claimed for this type of construction are that it eliminates protruding parapets at party walls, permits the use of fire-resistant asphalt shingles; and it promotes economical construction.

The roof construction extends on both sides to include the second rafter from the party wall. The roof deck is designed to fall at or beyond this

second rafter should fire cause it to collapse. This is accomplished by ending all roof boards over the centre of the second rafter on each side of the party wall. A 2x2-in. fulcrum nailed to the second rafter facilitates failure along the rafter.

Space between the rafter is enclosed with two thickness of ½-in. gypsum board, separated by wire mesh. The time-temperature rating of this construction is 1 hr. when wire mesh is used; 45 min. without the mesh. The gypsum board between the first two rafters does not fall when the roof collapses, but remains in place to serve as a deflector to prevent flames jumping over the parapet wall to adjacent dwellings.

Radiant-heat thermostat.

Surface-type Thermoray thermostat is sensitive to conviction air temperature and effect of radiant panels. It functions according to effective temperature, and is part of the Sarcotherm control system for hot-water radiant heating. It can also be used effectively for controlling electric Tradiant heating panels. The hermoray instrument can be used for line or low-voltage circuits, and can be furnished with double-switch action for any special control sequence.

Asphaltic pipe coating.

Gilsonite-asphalt-base asbestos-fibre coating is formulated expressly for use where corrosion from soil acids or air suspended acids attack metal structures or pipelines. Pro-Tek-To coating is designed for cold application and requires no heating, special mixing, or preparation. It can be applied by brush, or by special pipe-coating machinery.

Recovery Method Promises More Oil from Old Fields.

Tarbon dioxide, the gas that puts the sparkle in soft drinks, may bring new life to old oil fields. The technique, developed by Oil Recovery Corp., is known as the Orco process.

Carbon dioxide in a water solution is injected into the oil bearing formation in input wells. The company claims that the carbonated water, combined with an unrevealed "helper", modifies the condition of oil sands so the oil is more readily recoverable than by present water-flood procedures.

The process shows promise of potential importance in obtaining a "third crop" of oils from fields exhausted by other methods of primary and secondary recovery. Although the method is not ready for general use, field tests have been satisfactory.

Core studies indicate that the technique will reduce the fraction of irrecoverable oil to a new low of 10% of pore space. This would amount to recovery of two-thirds of the oil now left in the oil-bearing formations of some depleted fields.

The Orco process will probably also be used in conjunction with water-flood projects. Another possible application is as a supplement to primary production methods. The process may also be of value in recovering hydrocarbons from oil shales and tar sands.

Longest Gas Line.

Natural gas is now flowing to New York City in the world's longest gas pipe line. The line, built by Transcontinental Gas Pipe Line Co., is 1,840 miles long and 26 and 30 in. in dia. Its completion means the first major use of natural gas in the New York area.

Aluminum at Sea.

More than 2-million lb. of aluminum went into the superstructure of

America's largest ocean liner, the S. S. United States. This is the largest application of aluminum ever made in the marine field.

New Chemicals Offered.

Silicone-based enamel, a hybrid between porcelain and plastics, is announced by Glidden Co. It has the surface hardness and chemical resistance of porcelain without its brittleness. It has with-stood a fog of 20% salt-water solution for 4,000 hr. at 90°F, with no effect. It will be available commercially in a year.

Poultry and swine will thrive and grow faster on antibiotic feed supplement offered by Chas. Pfizer & Co. It contains terramycin and is called Bi-Con TM-5. Two pounds are added to each ton of feed. Pfizer tests showed growth increase of 15% in market-weight broilers and 10% in swine.

Denser, stronger, and more uniform concrete blocks and bricks are made by adding small amounts of Santomerse S, a liquid wetting agent made by Monsanto Chemical Co. It permits use of less water, thereby producing "dry" concrete of greater strength.

Grain Alcohol without Malt.

Lower-cost industrial alcohol from grain may be the result of replacing barley malt with fungal amylase. Recent commercial-scale tests by Grain Processing Corp. and U. S. Dept. of Agriculture indicate a saving of 3-4 per gal. at present price levels.

Alcohol made by this process will not compete with that produced by direct synthesis or by fermentation of black strap molasses. Nor will fungal amylase replace barley malt for whiskey production as the flavor is not the same

Fungal amylase is an enzymatic material produced by fermenting a mixture of a culture of *aspergillus niger* NRRL 337, ground corn, and calcium carbonate in a thin stillage with a 5% solids content. The mash to feed the final alcohol formenters is made by cooking the fungal amylase with additional ground corn and stllage.

Another barley-malt substitute is bacterial amylase. This is in the form of a dry powder and can be shipped. Fungal amylase should be made where it is to be used.

New Finish Saves Zinc.

More plating with less zinc is claimed for Allied Research Products Inc's new Iridite treatment for bright finishing of zinc plate in automatic machinery. Protective chromate film can be produced on zinc-plated coatings of less than 0.0001-in. thickness. Coating is flexible and can be applied in an immersion of 20 sec. to 1 min. No bleaching operation is required.

New Color Television Tube Shows Better Color Fidelity.

New three-color picture tube made by Radio Corp. of America operates on the same basic principle as the earlier version (McG-H Digest, July '50, p29), but it has marked improvement in color fidelity and image structure. It now has 2,00,000 holes in the metal mask behind the phosphor screen instead of 1,17,000, and the phosphor screen has 60,0,000 phosphordots instead of 3,51,000 in earlier demonstrations.

Red and blue phosphors in the new tube have a higher light output which permits a proportionate increase in the brightness of the red and blue primary images. Highlight brightness

ranges upto 20 footlamberts compared with the previous 5 footlamberts.

Another improvement is the substantial reduction in the visibility of the dot structure. This reduction is due to adoption of the Hazeltine by-passed monochrome transmission method.

The tricolor tube, in a press demonstration, did not reproduce highly saturated reds and blues as well as the Columbia Broadcasting System's rotating-disk system. But the gap between phosphor colors and filter colors has been narrowed so that either is satisfactory from a commercial standpoint.

Multi-ink Printing Press.

Construction of this press, developed in Sweeden, eliminates usual rubber rollers. The fountain is moved in direct contact with the print rolls carrying the rubber plater. Absence of rubber rollers permits color changes in 5 min.

Master Control.

New electronic system, called Telemaster, is designed for centralized combustion and process control. Electronic link between master and actuator eliminates distance problem caused by centralization. Advantages: simplified and small panels, elimination of transmisssion lags, and greater accuracy of response.

Electric Heat Removes Snow.

Snow removal from sidewalks, drive-ways, and garage entrances is easy and quick with radiant-heating installations. Such installations have an electric heating cable placed within rigid steel conduct and buried in the concrete or ground.

A typical installation, designed to melt 1 in. of snow per hr. at 26°F air temperature, would have 1-in. galvanized conduit spaced to carry 32 watts per sq. ft. This loading can be obtained by spacing conduits on 6-in. centres and burying them 1½ in deep.

Conduits should terminate in a pull box that contains copper terminal strips for the cables. The cable is lead-sheathed and is available in 60-ft. lengths for 120-volt service and 120 ft. lengths for 240 volts. The 90-ft. cable consumes 420 watts and develops a maximum sheath temperature of 165°F.

Research in Sweet Potatoes.

Observations made at the Indian Agricultural Research Institute, New Delhi, on the growth of various varieties of sweet potatoes indicate that among the white fleshed varieties, two Chinese varieties give a very good performance as compared to the best indigenous variety. Among the orange or yellow fleshed variety an American variety was found to be the best. These varieties can profitably replace the local varieties as they are superior in yield and quality. All the three varieties are moist-fleshed, have very little fibre and are above average sweetness.

Manurial experiments undertaken at the Central Rice Research Institute, Cuttack, indicate that ammonium sulphate when applied to paddy field in dry conditions gives slightly better results than when applied in wet condition. While this experiment has been carried out with 20 lb. level of Nitrogen per acre, the superiority of the dry method may show even better results with a larger dose of Nitrogen. This method is also easier of application in a large part of the rice area in India. The Institute proposes to test the method on a large scale incultivators, feilds during the coming rice season.

News & Notes

World's Crude-Oil Output Reaches New High Record.

Last year, the world production of crude oil resumed its upward trend after a temporary levelling off in 1949. Output in 1950 averaged 1,03,77,000 bbl. daily-up 11.5% from 1949. This average includes an estimate for Russia and Eastern Europe.

Largely responsible for the upturn was the recovery of U. S. production, averaging 54·03,000 bbl. daily to achieve a gain of 7.2% over the previous year. Total foreign production of 49,74,000 bbl. per day represented an increase of 16·7% over 1949. In 1949, foreign production had advanced over that of 1948 by 11%, whereas U. S. production had fallen 8.6 per cent.

An outstanding feature of last year's oil output was the development of the Middle East as a producing centre to meet a large part of Eastern Hemisphere requirements. Gain over 1949 was nearly 25 per cent. Iraq had the huge percentage gain of 56.5 per cent.

Other countries establishing new production records included Venezuela, Canada, Colombia, Mexico, Germany, Holland, Egypt and British Borneo. Venezuelan production was in sharp contrast to that of (49 when it was drastically curtailed because of the drop in the heavy fuel-oil market in the eastern part of the U. S. During the latter half of 1950, it was believed to be virtually at its maximum producing potential.

Buried-Block Resistance Tells when to Irrigate Soil.

Five Hawaiian sugar plantations are now determining when and how much to irrigate cane fields by using electrical instruments. This is an application of the Bouyoucos principle first formulated 15 years ago at Michigan State College.

Small plaster of paris blocks with wires running into them about an inch apart are buried in the ground. Five or six blocks may be enough for 70-80 acres where soil conditions are uniform.

Wires are run from each block to the edge of the field. At periodic intervals, resistance between wires in the block is measured with a Wheat, stone bridge. If the field is wet, resistance is low. At the maximum amount of water that the soil can hold, resistance of the block is 600-800 ohms.

As the soil dries out, the resistance rises gradually to 1,500 ohms and then sharply from there on possibly to 2,500 ohms the next day and 40,000-50,000 ohms a day or so later. This is the "wilt point" at which fields must have irrigation. Tests during irrigation show when enough water has been added to the soil.

Air Dries Food.

New food-drying technique under development uses no heat. Air at room temperature is recirculated over the food and through a dessicant. Capacity of air to pick up moisture is obtained by drying it, rather than by heating it.

Inns of Court to be rebuilt.

The rebuilding or repair of London's historic Inns of Court, which suffered disastrously from German bombing, takes a new step forward with the announcement that the foun-

dation-stone of the Inner Temple hall and library will be laid by the King some time in October. His Majesty is a Bencher of the Inn.

Plans drawn up by Sir Hubert Worthington, the architect, have been approved by the Ministry of Town and Country planning for the reconstruction of both buildings. Both were destroyed, but the library has been replaced by a temporary structure.

The hall, which might take between two and three years to build, will replace that built in 1868, when the original building of the Knights Templars was demolished. It will be substantially the same as its immediate predecessor.

Silver Mining in Scotland.

A distinctive type of metal known as Scotish silver may be mined once again in Britain. This has been disclosed by the Secretary of State for Scotland, Mr. Hector McNeil. "Up to the beginning of the century", he said, "we had operating at Sunart a project which covered zinc, some lead, and a distinctive ore which we call Scotish silver. We have entered into a contract with a private company so that exploratory work is being carried out upon this project."

Invisible Device to Protect Crown Jewels.

Britain's world-famous Crown jewels are no longer protected by heavy iron bars. They are now being shown at the Tower of London in a large octagonal showcase of glass devoid of display allows an entirely unimpeded view of all the details of this magnificent regalia.

A new and invisible system of protection that is a closely guarded secret has been substituted for the bars which formerly surrounded the showcase.

Oil Workers to visit Britain.

One hundred and twenty oil workers from 54 countries, including some from India, will visit the Festival of Britain this summer as guests of the British Shell Oil Company. They are all employees of the Company. They will visit Britain in groups, each party staying in the U. K. for about a month. The first of five parties will assemble on May 17.

New Sulphure-Saving Process.

A pilot factor for the production of fertilisers by using nitric acid instead of sulphuric acid for the extraction of phosphate from Morocco rock has been established by a leading British industrial concern at its Billingham-on-Tees Works. One of the greatest difficulties, which has now been overcome, was that the use of nitric acid caused the product to attract moisture from the air and to cake.

Sulphuric acid production at Billingham last year rose by 30,000 tons to 1,51,000 tons, but in January last a direction had been given to reduce output on the sulphur-burning plant by one third owing to the shortage of sulphur. It now planned to increase the output of sulphuric acid from anhydrite from 1,00,000 tons a year to 1,75,000 tons.

Earthworms Destroy Fungi.

An accidental discovery made at the Institute of Hygiene and Public Health, Calcutta has solved a problem which has baffled workers in the field of medical research all over the world.

Breeding of certain mites for use in medical research has been hampered in the past because of growth of fungi in the tubes. The Institute has discovered - accidentally - that addition of a species of small earthworms

in the tubes prevents the growth of fungi without hampering the growth of mites. The earthworms presumably feed on fungi.

In the Malaria Institute of India, Delhi, field investigations have shown that DDT remains toxic to mosquitoes for a longer time when used in the form of suspension (water wettable powder) than when used in the form of aqueous emulsion. The combined spray of DDT and B. H. C. was tried on a large scale in the field and its toxic effect on mosquitoes was found to be stronger and more lasting than any other insecticidal spray.

Screening of Liver Extracts.

The Central Drug Research Laboratory, Calcutta has worked out a laboratory method which is very useful in screening liver extracts under circumstances peculiar in India. The internationally accepted method for the assaying of liver extracts is based on chemical response of liver extracts on suitable types of anaemia cases. This procedure which necessitates hospitalisation and well-equipped haemotological laboratories, is of limited utility in India because of the required facilities. The laboratory method now evolved is based on microbiological technique and is adapted to Indian conditions.

In the same Laboratory, a hormone of the pituitary gland has been purified to an extent which makes it possible to use it on human cases of leucodema, to evaluate its action. A standard process to prepare the hormone on a large scale has been worked out. Simultaneously, the activity and toxicity of the hormone on warm-blooded animals are being studied.

Deafening Factory Noises.

An interesting investigation undertaken in the Institute of Hygiene and Public Health, Calcutta, relates to the effect that deafening factory noises have on the efficiency of the workers. The experiment has shown that the effect varies with different persons; in the case of some persons, the high frequency noises even increase their efficiency of work to a noticeable extent! Thus, expenditure on silencing of noisy factory sheds is not worthwhile, since neither production nor the health or the hearing of the worker is found to be seriously affected.

The Institute has also devised a model of a simple, cheap and effective latrine suitable for a family unit in rural areas. One such latrine has been installed in a village and has been found to give satisfactory service for the last many months. It is not only cheap but can be constructed by the villagers themselves with the help of simple implements and locally available material. Soil pollution, smell and fly breeding are obviated. This type of latrine can also be useful for scattered bungalows, wayside railway stations and other places where land for digging a trench is available.

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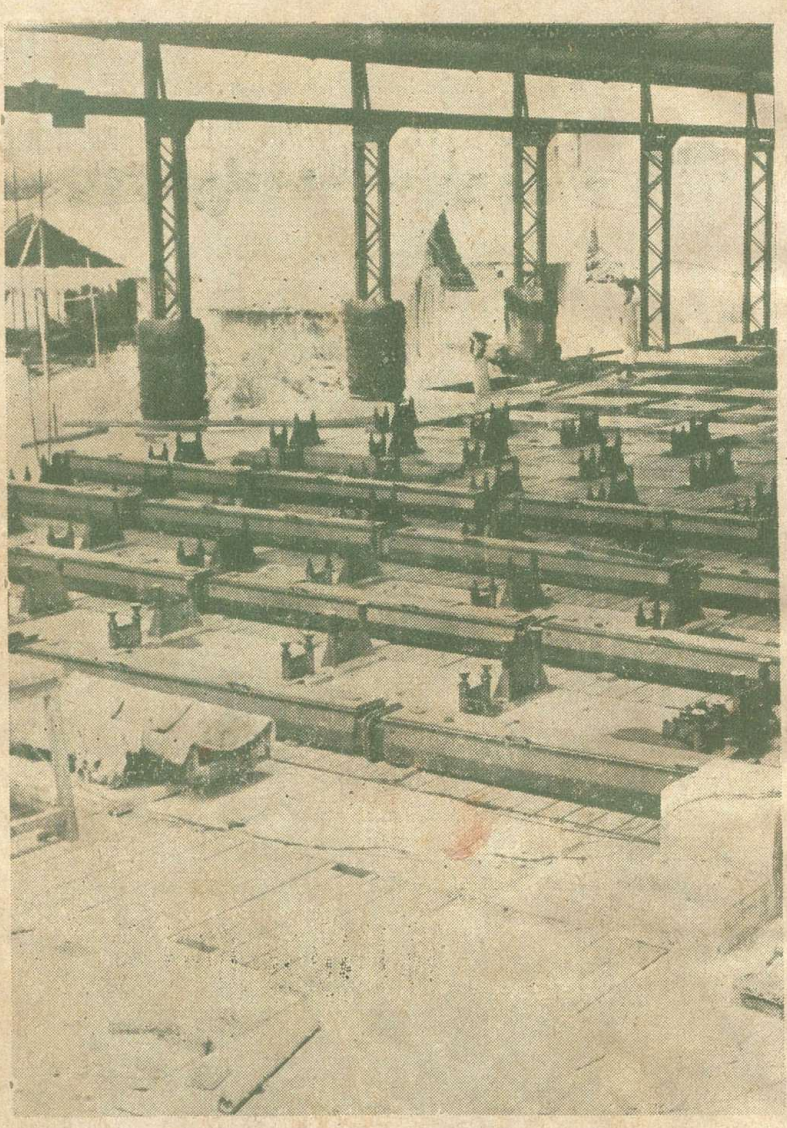

Caustic Soda Plant under construction Another View.

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