MODERN COMMERCIAL FOOD MANUFACTURE.*

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THE subject of food manufacture, whether it involves commercial or domestic food preparation, is at best, a homely and prosaic one—yet, withal, in itself, of interest, because of its large importance.

The relative importance to a nation of its food supply, in comparison with other essentials, is perhaps seldom adequately realized.

The food industry of the world is the world's greatest industry. From the tillers of the soil, and those who go down to the sea for its treasures, to the servitors at our tables, the number of those who are in some manner engaged in supplying the food demands of the human family, is greater probably than required for any other industry, as great possibly as for all others—vast almost beyond computation.

Food, shelter, raiment are the three great fundamental requirements of human life, and of these three food has been, from the beginning of time, the first consideration. To appease hunger was the problem of primitive man and his greatest stimulus to effort. His first and chief demand upon the earth and the elements about him was for food; and the first, last and most particular requirement of his civilized brother to-day still is that food be supplied him. This is the great common ground on which stand both savage and philosopher. Shelter and raiment were to aboriginal man of secondary importance—as they are also really of secondary importance to-day. Thus, being the one great essential to life itself, the struggle for food has probably been in all ages the influence that has contributed most to the survival of the fittest—the mainspring that has stimulated the action of the world.

It is not by any means an unwarranted assumption that the effort man has been compelled to put forth by this necessity has

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constituted the stimulus of human advancement—the responsible, underlying cause of our modern civilization.

For it is easily conceivable that if the incentive of hunger had not been given to the human race, the learning and luxury of modern times might have been much less evident, or that, if the daily demand of nature for food should miraculously cease, mankind would speedily retrograde.

If then, so much of our lives and so much of man's ambition are bound up in the great universal subject of "What to Eat and How to Get It," we surely do wisely to consider well what manner of food we are getting in return for life's struggle. Whether it is pure, clean and wholesome; whether it is calculated to give us the sustenance and strength, the health and prolongation of life that we have a right to expect; or whether it is sometimes so far a mixture of bad with the good, that almost literally we are given, when we ask for bread, a stone.

Food may be defined as consisting of those substances which are capable of sustaining the animal organism in a state of health and as that which makes possible the continuing existence of all forms of life.

There is a quality inherent in all food which, under natural conditions, renders it changeable and perishable. The atmosphere which surrounds us, coming as it does, in contact with every substance, unless removed or excluded as when in a vacuum, contains germs which are always active and whose mission is the destruction of all organic matter. These are the active causes of the change known as decomposition. To prevent such change, various means have had to be devised for keeping food from putrefaction and in a wholesome condition; drying, salting, chilling, heating, canning, coating with gelatin or fat for the exclusion of air, and the use of chemicals.

The practice of food preserving dates back to a prehistoric period. It is traditional, rather than historic, that man in the early ages, by a simple drying process, was afforded a means by which the accumulation of bountiful years and the surplusses of seasons of plenty could be carried over to provide sustenance through lean seasons and years of famine.

In hot climates, the heat of the sun was probably at first the sole preserving agent; while in colder latitudes where shelter and artificial heat were needed, we may well believe that the dis-

covery of the preservative quality of wood smoke and the taste for smoked meats and fish closely followed the discovery of fire itself and came about through the suspension of the family larder from the roof of the family hut, where the food became impregnated with the rising vapors from burning wood and peat.

It is thought that the first discovery of the preservative use of salt was quite as accidental and due to the finding of meat carcasses in a good state of preservation, embedded in the incrustations of saline deserts.

Meat and fish, as well as fruits and vegetables, have also been kept for certain periods by sugar alone, but in the light of later day experience, it is known that few articles of prepared food in common use can be kept *when exposed to air*, by any single preservative substance or process.

It is also known that the *exclusion* of air is not *alone* sufficient to preserve changeable food substances successfully, because foods cannot be so collected as to exclude organisms; and the yeasts, moulds and bacteria which have been carried to their exposed surfaces in the dust of the air will develop fermentative and putrefactive changes, unless in addition to hermetic sealing the food is sterilized by sufficient heat.

Modern food preserving in its broader adaptation may be said to have had its origin in the discovery by the Frenchman, Appert, in 1804, that an article of food first heated, then hermetically sealed and sterilized, would keep practically as long as the seal was intact, without the use of chemical assistance.

One year later, De Heine, then in England, patented a process by which he claimed that food could be preserved by completely exhausting the air with an air-pump. All attempts at this, however, seem to have been unsuccessful, until a process discovered by one Wertheimer in 1839 came to be used. This provided that the food to be preserved should be placed in tin or metal cans, the interstices being filled with water, juices or other fluid, and the lid to be securely sealed. The cans were then set in water and boiled, the air being expelled through small holes pierced in the lids. When the food was sufficiently cooked and the air entirely driven out, the holes were filled with solder, completing the process. Food thus treated would remain in a perfect state almost indefinitely. No very great improvement, other than the elimination of solder in the sealing of tin containers, has

since been made upon that method and no change at all in principle. And, while the *theory* of these men differed from that accepted by modern science, the same *means* are used and the same results obtained as to-day; the process here described being used in all large canning factories in America, as well as the countries abroad, and in principle at least, practised in every household in which fruits and vegetables are preserved.

Although Appert's discovery was made more than one hundred years ago, it is only within comparatively recent years that its commercial value has been so fully appreciated as to cause its extensive employment in a commercial way on the American Continent, at least.

The early influence of the discovery was quite marked, however, in the home kitchens of our thrifty forebears in the New England and Middle States, where, with ever increasing skill in cookery as generation followed generation, a high degree of success came to be attained in the preservation of the fresh fruits and vegetables of the harvest season for winter use.

The products of these home kitchens were many and varied. Their appetizing qualities were due to the excellence and freshness of the material employed; their keeping qualities were in proportion to the skill and exactness of their preparation and the cleanliness with which it was surrounded. No artificial chemical anti-ferments were known to our grandmothers and none were required in their preserving work.

"Preserves" was then a word to conjure with. It stood for the sole delicacies of a large proportion of the whole nation. It was the embodiment of feasting and good cheer. It lent an especial significance to holiday dinners and "company" suppers. It calls up to-day, visions of mothers and grandmothers, busy as bees in roomy kitchens, their faces aglow with the heat of their work and their pride therein; surrounded by pans and baskets of luscious and toothsome products of farm and orchard, and by the most tantalizing odors that ever assailed the nostrils of unappeasable youth. It brings to us visions of rows of enticing jars and bottles on high, forbidden pantry shelves; of moments of fond maternal yielding to insistent and flattering persuasion, and exciting conjecture as to what delicious jam or preserves would be forthcoming when the minister suddenly appeared at supper time.

But, with the passing of time, the old fashioned manner of living changed. The increase of wealth increased enormously the demand for luxury in living, while the gathering of the population in cities brought about a congestion which made the former method of supplying the food demand wholly inadequate, and it was with the coming of these conditions that the manufacturer of prepared foods entered upon the scene, to become one of the great factors in the nation's progress.

And it may be said, and I wish to emphasize this in passing, the principles and practices of these old-time home kitchens furnish the best traditions that govern the preserving industry of to-day. It is as true now as then, that the best results in product can only come through the employment of good material, the maintenance of a high degree of sanitation and the application of conscientious skill; and this, regardless of whether the work is performed in the home or the great commercial kitchen, but the demand upon the modern commercial kitchen in the way of almost infinite variety, makes these requisites to a high degree of perfection, doubly essential.

While the canning trade—that branch of food preparation which shows the most remarkable expansion—had its origin, as has been stated, more than a hundred years ago, it was not until a comparatively recent date that the canning business assumed the dignity of an industry and entered upon the era of expansion that has carried it to its present vast proportions, amounting, it is estimated, to an output of more than sixty millions of dozens of the three leading vegetables—tomatoes, peas, and corn—during the last season; not to mention the other millions of dozens of meats, vegetables, fruits, and miscellaneous foods.

I shall not indulge in statistics, because figures in this connection are too bewildering to convey a comprehensive understanding. To speak of a quantity of ten millions of bottles or twenty-five millions of cans is simple enough as a mere statement, but the actual quantity itself, resolved into an existing fact, is inconceivable to the average mind not trained to think in millions.

In the early days of the commercial food preserving industry, the manufacturer confined himself to a very few articles which, although honestly enough made, were more or less indifferent in quality. With improved facilities, however, his skill in cookery

gradually increased and with it the volume of his business; a development through which the food resources of the world have been wonderfully augmented, affecting not only our own methods of living, but changing the restricted diet of the Polar Regions and the Tropics to the bounty of the Temperate Zone.

For, in this progressive age, it was inevitable that this question should arise—as arise it did—“Was it not possible to duplicate, nay, to improve upon the time and man honored products of countless kitchens and skilful housewives; and to place them on the general market within the reach of all who wished to taste their delights?” It was possible and it was done. Prepared foods have grown in number until there is now estimated to be about five hundred, and through this growth the laboring man of to-day may, and does enjoy food luxuries which, fifty years ago, the rich could hardly obtain.

In the meantime, the business offered an inviting field for the not over-scrupulous manufacturer. It was found that inferiority of raw material, imitation and adulteration, artistically colored and thoroughly embalmed with artificial preservatives, could be so concealed beneath a veneer of attractive appearance and fanciful labelling, as to obtain a ready and profitable market; and, as evil always seems to be endowed with more vitality and spreads more rapidly than good, the evil of adulteration and inferior food preparation swept over the country like a prairie fire. That peculiar trait of the American people which is called “The bargain counter mania,” afforded the unscrupulous manufacturer an outlet for his lower priced product; cheapness became the goal of his ambition and this ambition was realized and the goal reached by placing upon the market, not only products which contained not a single drop of the ingredients of which they were supposed to be made, but products having no other claim to merit than to pay a profit to the manufacturer who produced and the dealer who sold them.

Such practices could not long exist, however, in a civilized community without attracting the attention of scientific men interested in the public health and welfare, and, out of the discoveries made by these men, came the agitation which finally led to the enactment of better State and National Laws for the protection of the people in this vital matter.

That the National Law has brought about a revolution in some directions, no one will deny. There is certainly less cheapening adulteration going on—less misrepresentation and deception; but there still remain many abuses to be corrected, chiefest among these, I believe, the continued tolerance, by compliant authorities charged with the administration of the law, of artificial preservatives.

The rapid growth of the preserving business in its early stages attracted much capital without corresponding experience, and in such cases, for the most part, business disaster was only averted by the extensive employment, in nearly everything produced, of chemical anti-ferments, which served as a protection against all the mistakes of cooking, sealing, and sterilization, and obviated entirely the necessity of proper sanitation either in methods or surroundings.

The first objection to their use, however, and, I believe the most glaring abuse that exists to-day, lies in their employment for the purpose of preserving partly spoiled and ill-cared for vegetables and fruits.

The principal substance that is used for the artificial preservation of vegetable and fruit products, as well as for meats and fish in some cases, is the drug, Benzoate of Soda—which, in its least objectionable form, is a tasteless and odorless derivative of coal-tar.

It is not my purpose to discuss here the extent to which the substance, Sodium Benzoate, itself, may be harmful. That is a scientific question, the discussion of which I am willing to leave to scientific men, confining myself rather to a few brief words concerning its possible significance in food products.

But, before proceeding to this phase of the artificial preservative question, I would like to call attention to the fact that the weight of scientific evidence, especially on the part of the medical profession, is strongly opposed to it and to suggest that if there is a doubt about the amount of injury that it causes, the people and not the manufacturing interests who desire to continue its use as a means of securing a greater pecuniary profit should have the benefit of that doubt.

As I have said, however, it is rather the possible significance of artificial preservatives in modern food manufacture, than their

own injurious nature, that I wish to touch upon. You may call it, if you please, "The Moral Side of the Artificial Preservative Question."

Let me state at the outset that every product of fruits and vegetables with which I am familiar can be successfully made in a commercial way, without artificial preservatives. This is evidenced, beyond dispute, by the fact that the entire product of at least twenty-five, and probably more, leading American food preservers is entirely free from these substances.

Why, then, should any one wish to continue their use? Commercial cupidity, my friends, yields very grudgingly to attempted reform. There is cannery waste to be worked up profitably into ketchups and soups—skins, cores, and decayed parts of tomatoes, cooked up and thrown into barrels to be shipped about the country for use as wanted. There are always job lots of spoiled or partly spoiled fruits and other similar materials lying about in the season that can be picked up cheaply. To say nothing of the expense attending its proper disposal, it is hard to send such material to the sewer when profit can be gained from it by sufficiently dosing it with a chemical preservative to protect it from putrid fermentation, and then disguising its taint with spices and flavors until it really becomes quite presentable and in some degree acceptable to those who do not discriminate very closely in favor of quality and who are only slowly learning the significance of the legend on the outside of a package: "Preserved with $\frac{1}{10}$ of 1 per cent. of Benzoate of Soda."

While the demand of the reactionary manufacturer for the continued tolerance of some kind of an artificial preservative is based upon several reasons, the principal pressure in its favor comes from users of tomato waste which has a commercial importance not generally understood.

Tomatoes are probably more extensively canned than all other summer vegetables put together—and all the canning is done in a period of six to eight weeks, under high pressure.

Tomatoes are also more extensively used in soups, condiments, sauces, etc. than any other fruit or vegetable—the consumption of tomato ketchup alone running into many millions of dozens annually.

In canning tomatoes, the canner's first and best attention is naturally to his principal product, and it may be said that it is

generally a most worthy product; but there is a great amount of waste—skins, cores, and decayed tomatoes—which there is neither time nor inclination to care for and which falls under foot disregarded as it accumulates.

Hundreds of thousands of barrels of this refuse are made in a season. It is pulped and put into the barrels under conditions that would better be left to the imagination than described, and then chemically "preserved" against actual putridity. It is safe to say that no one would ever again desire to eat any benzoated article after once seeing this material and its treatment.

This tomato refuse is sold at about \$1.00 to \$3.00 per barrel, to be made into tomato ketchup, soup, baked bean sauce, etc., which are eventually labelled as made of fresh, ripe tomatoes, and which carry only one protection to the consumer namely, a statement of the presence of the preservative on every label, which is put there under one of the occasional beneficent food regulations of the Agricultural Department at Washington, but it is always printed as small and obscurely as possible. Thus the consumers' only protection is to read all food labels carefully, including the fine print.

Such goods are extremely profitable, being sold at only a trifle less than goods made of the best raw materials, and it is really around the tomato waste industry that has rallied most of the effort for the nullification of the Pure Food Provisions of the National Food and Drugs Act.

A term much employed by the pro-preservative interests in their defense is "concealed inferiority" and elaborate arguments are set up to show that the addition of a chemical preservative to rotten tomatoes or fruit, for instance, changes neither the odor nor flavor of the material—while, as our friends proceed to show us, vinegar, sugar, salt, and spices will disguise unpleasant odors and flavors; and then they proceed to vigorously attack the use of the time-honored condimental preservatives, but there is a maxim as ancient as the time of Democritus which reads: "Whatever pleases the palate nourishes." Modern science has proven the truth of this maxim and has given us acceptable reason why condiments are necessary; why they are used by all castes, races, and civilizations. Acting principally upon the nervous system through the sense of smell, condiments stimulate the flow of both the saliva and the gastric juices. They materially aid

digestion, and the familiar phrase, "to make the mouth water," states a physiological fact.

And, unfortunately for the line of argument of the reactionaries, nobody contends or ever has contended, that Benzoate of Soda "conceals inferiority." Being tasteless and odorless, it has no more effect in that direction than would have so much cornstarch or wheaten flour. The expression "concealed inferiority" is simply one coined by the friends of chemical preservatives as a premise upon which to build false argument.

Artificial preservatives do not conceal inferiority, but they do permit and encourage disguised inferiority and the grossest fraud.

With artificial preservatives permitted, commercial cupidity is further aided, not only by the elimination of all need for factory sanitation and care in cooking, but as much water may be left in, to further cheapen the product, as suits the convenience of its maker. Also, bottles and other containers need not be washed and sterilization becomes a useless expense.

I have no hesitation in saying that the principal use of Benzoate of Soda and like substances in modern food manufacture to-day is either to permit the use of a lower grade of material, or carelessness in process. Its tendency is to lower quality in some direction all the time and to invite actually unwholesome practices, and the question of whether we are to have cheapness in our foods at the expense of quality and wholesomeness is as much alive to-day as it was before a Food Law was placed on the Statute Books.

We are turning the light into the obscure and unsanitary bake shop. We have cleaned up the meat packing establishments and deprived them of their artificial preservatives. It is high time that better attention should be given to the vegetable and fruit preserving industries, and that by the withdrawal of the temptation furnished by this mischievous preservative substance, permitted not by law but in spite of the law, we can come to feel that we are secure in eating only those things which we would readily eat if we saw them made and saw the material entering into their composition.

The modern manufacture of foods that are pure in the best and strictest sense, however, the really modern, up-to-date factory is not a place of gloom, dirt or mystery. And the underlying

purpose of the progressive manufacturer is to give the public the choicest products so prepared and packed as to offer at a reasonable price, the highest attainable degree of quality, purity, and cleanliness.

The chief reliance of the better class of food preservers is sterilization. In the preparation of foods by canning, preserving, etc., the most essential things in the processes are the sterilization not only of the food, but of all utensils and the careful sealing of the sterilized food to *exclude* all germs, because, as has been shown, both air and water contain bacteria and yeasts and may contain mould spores; and both foods and all utensils used in the process of preserving foods, are liable to be contaminated by these organisms. For this reason the appliances, as well as the food, must be sterilized until all life and sources of life in and about them have been destroyed.

Most of the appliances of the modern food factory are automatic. The direct personal contact with foods by human hands is discouraged and reduced to a minimum; and, where unavoidable, it is a modern practice that all who are engaged in work requiring this, shall have their hands frequently inspected and at brief intervals subjected to a thorough manicuring service.

Where kettles are used, the material is usually of burnished copper and they are provided with steam jackets which permit the application of high degrees of heat without scorching and of perfect, instant regulation. Conveying pipes for liquids are usually silver lined to prevent the action upon them of fruit and vegetable acids and the sterilizing appliances, both for containers before putting them into use and after filling, are the best that scientific skill can devise.

The doors of such great modern commercial food kitchens are nearly always wide open to visitors, to permit the freest possible public inspection of both materials and methods.

Those who cherish the belief that the kitchen of some vigilant and ultra-fastidious New England relative embodies the highest degree of spotlessness possible to human achievement, freely admit, after seeing both, that in the modern commercial kitchen, even she, with all the honor that is her due, has been outdone and surpassed.

In the invitation extended to me it was suggested that I present some illustrations—a suggestion which I accepted some-

what hesitatingly, because the only readily obtainable views for use in this manner would of necessity be from the establishment with which I am personally connected. However, they are for the most part only typical of what exists in many other similar establishments.

Fifty-four lantern slides were then shown illustrating the growing, gathering, and preserving of vegetables, the harvesting of olives and the preparation of olive oil, and the process of preserving the various fruits from the fresh product to the sealed can.

The speaker closed with the following remarks:

Thus you will have seen that the modern commercial preserving idea is, in all essential respects, that of the housewife of long ago. The fine, old, home-made idea. The housewife selected her fruits and vegetables with anxious care, choosing only the best, as befitted so important an occasion as the preserving season. In her snowy kitchen, she prepared them and put them up according to time-honored recipes. This is the modern, up-to-date preserver's idea precisely, in its primitive fundamentals, but it is improved upon vastly. He goes forth into scores and hundreds of gardens and orchards, and he too, selects the best and discards all else. He, too, works in snowy kitchens, but in kitchens where cleanliness is enhanced by sanitary precautions and appliances beyond the housewife's reach; and the recipes upon which his work is conducted are simply the good, old-fashioned, housewifely kind, but improved and refined by the best work and thought and experiment that capital can supply or painstaking care obtain.

Hypochlorite Treatment of the Omaha Water Supply. JAY CRAVEN. (*Eng. Record*, lxiii, 128.)—This article shows the efficacy of settlement followed by hypochlorite treatment in removing bacteria from the water supply. The water is first pumped into sedimentation tanks and allowed to settle. When the water is very turbid, aluminum sulphate is used as a coagulant. This sedimentation reduces the bacteria 97.4 per cent. The settled water is then treated with hypochlorite, in the proportion of 0.3 parts per million of available chlorine, ranging to 0.35 or 0.4 parts per million according to conditions, which gives a further reduction 93.3 per cent. in the bacteria in the settled water, making the total reduction in bacteria 99.83 per cent.