of a mile in diameter, and from four to six hundred feet in depth. For many years it has ceased to emit lava, but so recently as 1874 several large fissures opened in the floor and sides, and from them stones of considerable size, ashes, and vast volumes of vapours were emitted. The descent into the crater is easily effected. We found steam issuing at high pressure from several orifices in the floor, around which crystals of sulphur and other products of sublimation had collected. On the south-west side of the crater, about twenty feet from its floor, we saw a large opening apparently going down a considerable depth into the heart of the mountain. From it loud surging noises proceeded, as if much-agitated lava existed within it, but no lava could be seen, and the air which proceeded from it was so fearfully hot that it was impossible to approach within many feet. At the orifice itself I believe it would have readily melted lead. Hot sand and blue and green flames are frequently emitted from this bocca.

A small fisherman's boat carries the letters twice a week to Stromboli, but as the weather was particularly fine, we determined not to wait for it, and started on January 5 in a small open boat, with four rowers. The distance is about twenty-three miles, and the course passes between the group of islets, eleven miles from Lipari, of which Panaria is the largest member. The sea was perfectly calm all day, and we had to row every inch of the way. A few miles from Stromboli we came upon a parrot-billed turtle asleep upon the surface of the water, and rowing gently up to it, the sailors secured it before it had time to dive. We arrived somewhat late in the evening and started for the summit (3,090 feet) the next morning at seven o'clock. The ascent is steep, and occupied us two hours. The great conical shadow of the mountain was seen stretching many leagues out to sea, and gradually approaching the base of the mountain as the sun got higher in the heavens. From the time of Pliny the inhabitants of Stromboli have asserted that the eruptive force is always weaker in calm than in stormy weather. They reiterated this again and again, and undoubtedly changes in the atmospheric pressure may effect it. Our calm day was unfortunately followed by a comparatively inactive condition of the volcano. It gave forth, indeed, enormous quantities of steam, but red-hot ashes were only ejected at long intervals of time, and never to a height exceeding 200 feet, and the sight at the summit of the mountain was altogether less interesting than that presented by Vesuvius even in its condition of *piccolo eruzione* a year ago. We descended rapidly over steep beds of fine volcanic ash, reached the base of the mountain before noon, and returned to Lipari in the afternoon. Some days later, while steaming from Messina to Naples, we passed within sight of the crater of Stromboli, which was obviously in a state of increased activity.

G. F. RODWELL

SOMETHING ABOUT MILK

A SPECULATOR upon the possible fluctuations of that inscrutable phase of human attribute which we know as "fashion" or "custom" might find material for a lucubration of no small interest in a forecast of probable results, supposing the influence exercised by it on many of our largest branches of trade were to extend itself to certain others which appear thus far to have escaped it, and are therefore more or less unprepared to encounter one of its eccentric revolutions.

And yet in an age when the successive crazes for novelty are certainly as rampant as ever they were among the *haut-monde* of the ultra-æsthetic Greek metropolis, it is hardly safe to reckon upon the endurance of any purely customary feature of life merely on the strength of its universality or even its long standing. Probably not one man in a thousand takes the trouble to realise to himself the degree in which many of our most indispensable demands are really maintained by conventional habit. And in no instance is this more likely to escape appreciation than in that of the so-called "necessaries," whose "intermittent service" is as much taken for granted as the return of daylight.

The milk-supply of any large centre of population, to be anything like efficient, must rest upon a series of conditions so various, so complicated, and so linked together, that probably no one unacquainted with the details of both the material itself and the machinery of its delivery, has any idea of the extent to which the dislocation of any one of them might entangle the whole. Complex and unstable in its physical constitution to a degree far beyond any other of the "perishables" in hourly requisition, milk of every description is for this very reason in tenfold greater risk of imparting a shock to the foundations of its trade if society should happen to rush into any modification of its conventional uses. Every one is prepared to awaken in the morning to a sense that the world has decreed a new system of coiffure, or set up another Dagon of Form or Colour since last night; but should the popular vote be found to have discarded the teaspoonful of cow's milk which the habit of years has mingled with certain sups of boiling vegetable infusion, and which in fifty cases out of a hundred bears as trivial a part in the actual nutriment of the body as it does in the gratification of the palate—surely we have but a faint conception of the dismay which would greet the reduction of the milk-supply by some thousands of tons daily, from a cause so easily conceivable.

The miniature ocean of milk in consumption during every four-and-twenty hours in the United States alone has approached, if not exceeded, 200,000,000 of gallons; a quantity approximately sufficient to fill the Grand Junction Canal half way from London to Birmingham, with something to spare for locks and evaporation. We may picture to ourselves society stretching itself one dull morning and observing that after all this antiquated "fad" of mixing a driblet of milk with the infusions of tea or coffee is a very curious one—difficult to trace, and still harder to account for. Indeed our doctors and chemists are telling us that many of the choicest qualities of milk are annihilated by contact with a hot liquid, and that in the particular case of tea it is even so far decomposed, or recomposed, that it is absolutely not milk at all that reaches our digestive organs, but a mixture of semi-saponified fats with an entirely new compound of curds and tannin. As a correspondent of one of the food journals has aptly observed, "there may be nothing like leather, but a leather lining to one's stomach is hardly an illustration of the eternal fitness of things.

"The habit is really a culpable waste, and it is time we laid our heads together to blow it up." Then the dairy trade would rise to find its business cut down to one-third of what it was, the demand for milk being suddenly limited to creaming, cookery, and babies, and a vast industry would be upset, until it had perforce adjusted itself to the new requirements.

Upon some few conditions of this order, or rather upon the absence of popular appreciation of them, have grown up several of the standard prejudices on the matter of milk and its value and method of use, which it is often thought impossible to combat, and which therefore it has been the aim of dairies and milk-sellers rather to compromise than to make evident. It is true that science is still but on the threshold of the subtle changes characteristic of all compounds which originate in the action of vitality; and theories "understanded of the people," are not easy of diffusion so far as to bear the fruit of popular common-sense. Yet if it were practicable by a sort of bird's-eye view of the whole question to enforce a general apprehension of a few comparatively simple facts, there is no doubt that both the public and the trade would benefit

by the disappearance of a tribe of erroneous fears, annoyances, and malpractices, which are reciprocally inflicted on both parties. And this with the result that the natural use of fresh milk would commend itself to the world in such a manner as to compensate the hypothetical disorder entailed by any such freak of fashion as above indicated.

Foremost among these easily-defined but little-known facts stands the exceedingly sensitive nature of the material itself, a clear conception of which alone would wipe out many charges against unoffending causes, and prove a natural and inevitable salve for many sore grievances. In the first place it must be distinctly realised that *nearly the whole* of the vast demand made upon milk is, in fact, outside its natural functions; and is, so to speak, *ab initio*, an unfair one. Nature never designed milk for exposure to atmospheric air or variations from its own limits of temperature, its primary purpose being to gently supplement and gradually replace that source of the earliest sustentation which commences from the fountain of life itself. It is scarcely necessary to point out that in the natural process milk is but a transition-compound, evolved directly with the blood, and passed (without delay, exposure, or appreciable change of temperature) from the body of the parent to that of the offspring, there to meet with an immediate assimilation by which the conversion into blood is completed. If practical evidence of this were needed, the chemist and comparative analyst will point with interest to the really very inconsiderable difference both in mechanical and chemical structure which subsists between the two.

Similar also is their behaviour when cooled and exposed to the air, save only that the changes occurring in blood show it to be even more susceptible of chemical alteration than milk.

Have we then much reason in our surprise or complaint when this exquisitely delicate compound occasionally resents the outrageous changes from heat to cold and back again—the hours of ruthless jolting and contact with air of every degree of impurity, which we expect it to sustain with unruffled sweetness of temper?

Rather let us marvel that a confection (for such it really is) which the tenderest care can hardly retain in its pristine perfection, should so often reach our breakfast-tables with the refinement of its true quality so little impaired.

Only of late years have even the commercial authorities practically learned the lessons of purity which some of them have so creditably endeavoured to teach us by concentrating the business within large-scale establishments when time and capital are really devoted to securing the desired care.

Now let us look more closely at one or two of the innate peculiarities of milk, in consequence of which a large amount of grumbling is almost invariably lavished upon the wrong heads. The most pregnant of all these is what we shall call its *effluvium*, that is to say, effluvium in the strict sense, to which nothing offensive *necessarily* attaches.

Every known substance is capable, in a greater or less degree, of both diffusing and imbibing effluvia or vaporous compounds which are often beyond the reach of any chemical estimation. These become known to us, *if at all*, through the sense of smell, and only subsequently by their action on surrounding matters. Probably but few persons outside the scientific world would be prepared to hear that it would be *next to impossible to devise a compound liquid more susceptible to effluvial influences than fresh milk*.

Imbued at its outset with a slight and agreeable effluvium of its own, it possesses every condition of structure favourable to the reception and retention of every volatile matter approaching it. Most persons are aware of the affinity of all oily matters for odoriferous principles of any kind, and to such as are acquainted with the composition of milk, an illustration of daily occurrence cannot seem overdrawn. A can of milk is received into the house in the evening, and according to a tradition, commendable as far as it goes, is at once poured into a clean earthenware jug; there is no cover, perhaps, but the vessel is clean. This is stood, say on a stone shelf in the larder, to keep cool and free from taint. Its companions there are a joint or two of cold meat (in its gravy), a few unfinished tarts and blanc-manges, a large bowl of scrap-bread (with incipient fungoid growth), a couple of dozen of eggs (not *all* fresh), underneath, the cheese; overhead, a jar of onions in pickle; in the near distance a few head of game in an advanced stage of—well, "keeping", and last, but not least, a closed window. Now, what is the "action" hereupon? A thousand to one, the temperature of the milk is, when received, *different* to that of the air in the larder (whether higher or lower). Immediately that it comes to rest, the surface next the air becomes warmed or cooled as the case may be, and by giving place to other portions, sets up a series of gentle currents, by means of which every part of the fluid is successively brought into contact with the air, and its countless crowds of butter-corpuscles, containing fatty matter in a high state of sub-division, are enabled to expose the greatest possible extent of surface. Now it is scarcely the fault of that milk if in ten hours' time it has failed to lay by at least a trace of every shade of effluvium which has had a chance of circulating near it. And yet when the pardonable nastiness of the milk is commented upon at breakfast, there will not be found wanting some one to exclaim, "What *can* those people feed their cows on?"

Is it necessary to follow the case further? into the nursery or sleeping-room, for example, where the half-breathed air, kept in active movement by the human lungs, and laden with suspended moisture condensing carbonic acid from every direction, heightens even further still the conditions of contamination, while the temperature is such as to place the unfortunate milk upon the very tenter-hooks of absorptiveness. Indeed, one must repeat that a plan could scarcely be devised, short of actually pouring in acetic acid, to communicate the taint of sourness with such absolute certainty and rapidity.

In every grievance, therefore, that arises on the score of *bad or tainted* milk, let us at least learn to distrust the *last* place it has been in rather than the *first*; and ask ourselves whether it is not possible that a substance which has already gone so far out of its way to serve us may not have been finally "put upon" in a manner for which our own end of the transaction is alone responsible. Let it be borne in mind that our own care of the milk we purchase is *more important* than that which precedes it, for two obvious reasons—first, that we receive it at a late period of its life, when it has already suffered from previous ill-usage, and is therefore more susceptible of injury; and secondly, that we receive it in *small quantities*, and thereby expose a proportionately larger surface to contamination.

The other chief point upon which general prejudice is still much astray is that of modern adulteration. There is no doubt that within the last ten years that which was the rule in this respect has become the exception, and it is a high satisfaction to be able to say that in London especially there is even less cause for present uneasiness on the score of tampering with milk than is popularly supposed. The system of supervision and the simplicity of tests have really driven the ancient mysteries of "Bob" and "Simpson" into a remote corner, and Annatto stands forth in the daylight with an easy conscience.

Pure milk, and not only pure but *clean* milk, can be obtained with certainty at current prices, and when this is the case it will take no long period to obliterate the common fallacy which still clings to the idea that yellow milk must be rich, white milk chalky, and blue milk

watered. Annatto openly accomplishes the first, nature has no occasion to be ashamed of the second, nor an exhausted cow of the third.

There is reason to hope the time is not far off when it may be said of town milk-supplies that if we will only do our part in taking care of the pence, the pounds may safely be trusted to take care of themselves. And if we have no justification for the comparatively hard service still required of milk, we may at least allow it a precedent dating from a time even earlier than that at which any land can have "flowed with milk and honey."

ARTIFICIAL PRODUCTION OF DIAMONDS

GLASGOW seems determined to have the honour of producing the diamond artificially. In spite of Mr. Mactear's recent failure, Mr. J. B. Hannay, whose paper on the solubility of solids in gases we published not long ago, has been utilising the method indicated in that paper in experiments on the artificial production of the diamond. Mr. Hannay reads a paper on the subject at the Royal Society to-night, and any remarks on his work we shall postpone for the present. Meantime from the letters and articles that have appeared in the papers, we may form some idea of what has been done. Prof. Story Maskelyne, writing to the *Times*, says :—

"A few weeks since I had to proclaim the failure of one attempt to produce the diamond in a chemical laboratory. To-day I ask a little space in one of your columns in order to announce the entire success of such an attempt by another Glasgow gentleman. That gentleman is Mr. J. Ballantine Hannay, of Woodbourne, Helensburgh, and Sword Street, Glasgow, a Fellow of the Chemical Society of London, who has to-day sent me some small crystallised particles presenting exactly the appearance of fragments of a broken diamond. In lustre, in a certain lamellar structure on the surfaces of cleavage, in refractive power, they accorded so closely with that mineral that it seemed hardly rash to proclaim them even at first sight to be diamond. And they satisfy the characteristic tests of that substance. Like the diamond, they are nearly inert in polarised light, and their hardness is such that they easily scored deep grooves in a polished surface of sapphire, which the diamond alone can do. I was able to measure the angle between the cleavage faces of one of them, notwithstanding that the image from one face was too incomplete for a very accurate result. But the mean of the angles so measured on the goniometer was 70 deg. 29 min., the correct angle on a crystal of the diamond being 70 deg. 31·7 min. Finally one of the particles, ignited on a foil of platinum, glowed and gradually disappeared exactly as mineral diamond would do. There is no doubt whatever that Mr. Hannay has succeeded in solving this problem and removing from the science of chemistry an opprobrium so long adhering to it; for, whereas the larger part of the great volume recording the triumphs of that science is occupied by the chemistry of carbon, this element has never been crystallised by man till Mr. Hannay achieved the triumph which I have the pleasure of recording to-day. His process for effecting this transmutation, hardly less momentous to the arts than to the possessors of a wealth of jewellery, is on the eve of being announced to the Royal Society."

The *Glasgow Herald*, in referring to Mr. Hannay's discovery, states in a general way that his process "involves the simultaneous application of enormous pressure—probably many tons on the square inch of surface within the apparatus—and a very high temperature, ranging up to a dull red heat. It may be said that the process is the outcome of a thoroughly scientific investigation into the subject of solution, and not a 'happy-go-lucky' hit. We understand that hydrocarbon compounds have been used in the process, but we have some hesitation in concluding that the crystalline carbon is of necessity obtained by the dissociation of those compounds; by and by, however, that point will doubtless be satisfactorily established. So far as we can learn, Mr. Hannay's experiments were not all successful, there being, it is said, far more failures than successes; the latter, however, occurred near the end of the series, thus showing that the operator had become familiar with the conditions under which the dissociation of the carbon was effected, and its subsequent deposition in the crystalline form. It would seem that up to the present only very small crystalline particles have been obtained, and hence the process must be an exceedingly expensive one to produce a real gem; something like spending 5*l.* to get 5*s.*, to speak roughly."

Prof. Roscoe, writing to the *Times*, states that the use of his name as having accepted Mr. Hannay's discovery as an accomplished fact has not been authorised by him, and that the evidence yet submitted to him by Mr. Hannay is insufficient, in his opinion, to establish so important a conclusion.

THE HISTORY OF WRITING[1]

II.

THE new alphabet eventually made its way from the Delta to the old home of the Phœnicians on the coast of Palestine. Already in the time of David the Syrians had their historians and state annals, and Hiram of Tyre, we are told, wrote letters to King Solomon. The Phœnician alphabet, as we may now call it, was communicated to the Israelites along with other elements of culture, and the neighbouring populations of Edom, of Ammon, and of Moab received it at the same time. Names had already been given to the letters, derived from Phœnician words which began with the several letters of the alphabet, *a*, for instance, being called *aleph*, "an ox," *b*, *bêth*, "a house," and so on. In this way the meaning of each letter was the more easily impressed upon the memory of the Phœnician schoolboy, just as in our own nurseries it used to be thought that we should have less difficulty in learning our alphabet if we were taught that "A was an archer who shot at a frog," than if we were simply told that A was A. Names and letters alike were imported into the countries that adjoined Phœnicia, and in course of time inscriptions in the new characters were engraved upon stone, as well as painted on the more perishable materials of papyrus or bark. The earliest monument of the Phœnician alphabet that has come down to us is the famous Moabite Stone, discovered a few years ago on the site of Dibon, which records the conquests and buildings of King Mesha, the contemporary of Ahab. The forms assumed by the characters upon this stone must have been the same as those employed by the Jewish prophets when writing down their prophecies or recording the history of their times.

Meanwhile the northern neighbours of the Phœnicians, who lived on the shores of the Gulf of Antioch, had been venturing on trading voyages into the far west and carrying with them a knowledge of the alphabet along with the wares and pottery of the East. They had found the inhabitants of Asia Minor and the adjacent islands in possession of a syllabary, the origin of which is still a puzzle, but as they pushed further westward into the islands of the Ægean and the harbours of Greece, they discovered a people wholly illiterate and unacquainted even with the rudiments of picture-writing. Amongst this people whom we now term Greeks, they soon established colonies, the most important being at Thebes, and in the islands of Melos and Thera. The island of Thera was probably the first spot on European soil where words were translated into written symbols. The earliest Greek inscriptions, it is believed by competent authorities, belong to Thera, and

[1] Lecture at the London Institution, February 12, by Prof. A. H. Sayce.

Continued from p. 380.