

LECTURE  
ON  
SOAP MAKING

BY  
MR. THOS. A. COOK,

ON  
MONDAY, APRIL 3rd, 1905,

AT  
58 ROMFORD ROAD, STRATFORD.

---

CHAIRMAN:  
Mr. T. F. AUKLAND (COMPANION).

---

WHEN first asked to read a paper to your well-known society, I confess that, though I felt the honour to be great, I also felt the responsibility heavy. Since undertaking the task I have been privileged to see a paper read to you by Mr. W. J. Harding on a subject of the deepest interest, "The Development of Torpedo-Boat Destroyers." I was amused to see that in his opening remarks he quoted a blue-water proverb, "Providence sends grub, the devil sends cooks." Like all *ex parte* statements, I hope that this is open to varying interpretations, and as "Cleanliness is next to Godliness," and soap-making is before cleanliness, please hold an open mind on the subject till the conclusion of my paper. The soap-maker, or soap-boiler, as he used to be termed, has been held up in fiction as a ridiculous but usually rich upstart. The soap-maker of to-day has generally received an expensive education, but his road to riches is more uphill than of yore.

Soap-making, which used to be a rule of thumb—or, let me rather say thumb, tongue, and eye process—has become a scientifically exact process. When I tell you that we finish off in huge pans 15 ft. by 15 ft. by 15 ft. approximately 60 or 70 tons of soap at a time, so finely combined that the addition of a few ounces too much soda would be detected and complained of by our laboratory, you will appreciate the nicety of our methods. When I tell you that, besides having two directors who are fellows of

the Chemical Society, we have two well-equipped laboratories and four or five trained assistants, that we have a most qualified engineer, fitter's shop, machinery driven by steam, electricity, or gas, according to which motive-power best suits their duties, boilers developing between 3,000 and 4,000 h.p., an office fitted with most up-to-date letter-files and fitments, elaborate telephone exchanges, and a typewriting-room, general engineering stores, efficient fire brigade, electrician, boiler-maker, farrier, and wheelwright, and last, but not least, a publicity department—all the above on our own freehold premises—you will see then that the up-to-date soap-maker wants to know more than where to place his h's and how to add his ledger. When I tell you that the modern soap-maker has to have his circulars printed in every known language and has his emissaries in the remotest parts of the globe, and that Great Britain last year exported 52,800 tons of soap, besides supplying the great bulk of that used in home consumption, you will not fear that soap-making is among Great Britain's dying industries.

My late father, Mr. Rider Cook, and my grandfather often told me of the days when there was an excise duty on our commodity, and we still have one or two pans which show the strong hinge-holders of the then necessary—now, thank goodness, unnecessary—heavy iron lock-down lids. When the pan of soap was made the wary officer locked it up till ready for turning out, and then watched the process, gauging the finished article to levy duty. Woe to the careless soap-maker who turned out bad stuff! And remember those were rule of thumb days. Every bit that, after stretching his conscience to the widest extent, he had to condemn as unfit for delivery had to go back to the pan and pay duty again. The excise officer had access night and day. And my grandfather being manager of his own factory, living at the work—as, bless them, they did in good old days—was often turned out in the “wee sma' oors” to show the excisemen round the works. No wonder the gentlemen referred to before as being responsible for cooks was also credited with flying off with the exciseman.

I purpose dividing my paper into five heads :

1. THE CHEMISTRY OF SOAP-MAKING POPULARLY PUT.—Broadly speaking, the process most commonly used is divorce, followed by a new union. You may not all know that most fats are very complicated organic chemical compounds, but most of them consist of certain varying acids (fatty acids) com-

bined with a base glycerine. This base is replaced by caustic or carbonated alkalies, either soda or potash; and the liberated glycerine in a more or less pure condition set free, being more valuable single than united, is generally forced to live a single life unless swallowed, when I suppose it again enters into combination with the human fats, but after this, of course, never finds its way into the soap pan again. The processes by which this chemical change is effected are various; but, before speaking of them, I will briefly refer to curate trades—i.e., the preparation of the raw material—many of which trades are carried on in many modern soap works, and some in nearly all of them, viz., tallow melting, bleaching and splitting, cottonseed crushing, pressing, the refining of the oil, and dealing with the products, palm oil rendering and bleaching, also the preparation of caustic and carbonated alkalies (these latter industries only in the North, where coal is cheap enough). All highly technical processes which require science, skill and capital.

2. THE PROCESSES AS PRACTICALLY CARRIED OUT.—You will remember the 15 ft. by 15 ft. by 15 ft. soap pans. These are used for making what we call fitted soaps. The American term, settled soap, expresses the process better. These pans are fitted with three 2½-in. steam pipes with separate steam cocks. The first curves around to the back of the bottom of the pan, the next goes right across the middle, and the last curves round to the front. They are perforated on either side with a large number of holes, through which the steam can be blown direct into the soap mass, so that the soap-maker can regulate his boiling in all parts of the pan. He loves, as a rule, to open up all three simultaneously to their widest capacity, though this habit is not appreciated by the stokers. Into these pans the tallow is blown hot, but refined, from the tallow department; solutions of caustic soda are run in from various conveniently placed tanks until the soap is nearly made. When the soap-maker judges that he has soap, not tallow and soda, in his pan he carefully tests and stops the introduction of soda before there is any trace of free soda being present. Then a simple mechanical process is adopted. Have you ever tried washing with soap in sea water? If so, you know that soap will not dissolve in salt water. Well, thoroughly to saponify the soap mass too much water has been used in thinning out the solution. It is now necessary to get rid of this, so the soap-maker throws a lot of common salt (I say common with caution, for pure NaCl is used, but people call it common salt). This is

dissolved by the surplus water, and the discarded soap floats on the top of the salt water, which contains, besides any impurities, the before-mentioned glycerine. When quite separated, this so-called "spent lye" is run into convenient tanks to be dealt with later on. The soap curd is boiled and re-boiled, and, strange as it may sound, finally washed free from all superfluous soda by a pure solution of brine, which when separated is called "half-spent lye" and used again on an inferior grade in the first-mentioned or spending process. The last process of all is the fitting and settling. When this has been performed the soap is left to settle itself for from three days to a week. We always believe in fitting so that Sunday comes into the process; it saves a day and entails no work. There is one great danger in these processes—a danger that every housewife will appreciate—namely, the danger of a boil-over. When the chemical combination technically called "closing" commences, great heat is evolved, and the soap mass swells rapidly, when, if not promptly dealt with, three-quarters of the contents of the pan will soon be on the floor. The contents of a 15 ft. by 15 ft. by 15 ft. pan will, if spread out an inch thick, cover about an acre, or perhaps rather more. We once had a pan boil over so rapidly that the man in charge ran away without being able to turn off steam; the result was that nearly all of the boiling contents went down to a floor below, where a foreman was quietly at work in a small office. The boiling avalanche cut off his retreat, and he shivered in the heat lest he should be submerged. To propitiate the Employers' Liability Insurance Companies, we have moved that office away from the soap-making department. But these incidents can be avoided by careful foremen to a very great extent. When the settled soap is cool enough it is pumped by steam pumps into iron cooling pans which hold about 12 to 15 cwt. each. There it stays about thirty hours, and then is cut by wires. The most modern way is to have frames on wheels with detachable sides and ends. When the block is cool the sides and ends are removed, and the block is run into a machine which pushes the block through a frame of wires, whence it emerges a heap of slabs. These slabs are passed crosswise through other wires which divide them into bars of suitable dimensions, about 3 lb. each being the most in demand at present. The bars intended for tablets may be placed on conveyors which separate them into three equal portions by thrusting them through a frame containing two other wires. They are then dropped into a machine constructed with cams and dies, and running with the rhythm of a sewing

machine. This turns them into fairly well-finished tablets, which emerge, jumping on to another conveyer, like a flock of sheep through a gate.

Seated each side of the conveyer are a lot of eager girls who seize the first tablet which comes to hand, and with extraordinary speed throw a wrapper round it; very few tablets escape to the end of the conveyer, and very few minutes are the girls kept waiting. This is an ideal, but not universal way of soap tableting. Very few makers have work enough in one run to keep such a machine running week in and week out, though some have many machines at work. The "fitted" or "settled" soap is London's pet and England's favourite, and in the form of primrose or yellow, or washer or cleanser, may be found in some form or another in nearly every oilman's or grocer's in England. But there are many other processes. The "curd" soap is saponified and then boiled by dry steam—that is to say, steam contained in long, unperforated but trapped steam coils; by thus driving off the moisture a very dry curd is left floating on very concentrated lyes. The pans in which these soaps are made usually have perforated as well as dry coils. Curd soaps are used for silk washing and blanket milling on a very large scale. Then there are cold, or as the French call them, *mi-froid* processes, where the solutions are added to the fats at such a temperature that the heat resulting from chemical combination finishes the process. These, however, require a basis largely composed of cocoanut oil, which makes a soap hardly appreciated by Englishmen. Such a soap they charge you one franc for at a Continental hotel for one night, and even then you don't think it worth while to take it away.

Quickly made soaps, like cheap blue mottled and marine, may be boiled and turned out in a day, but they, again, depend on the ease with which the hard vegetable oils are saponified. Then we come to soft soap—very important in the engine-room and on deck—used in the Royal pantry and in the humblest stable, invaluable to the diplomatist as to the beggar; everybody hears about it, but many do not know how it is made—the commercial quality I mean, not the diplomatist's. It is a simple process, but needs care. Sweet vegetable oils are combined with solutions of caustic potash, but so carefully as to leave a quite neutral product. Some makers use fish oil. The product looks nice, but when used in hot water the result is an aroma which puts one off using such a soap—at any rate, for spoons and forks. You who have used soft soap may have noticed

little white specks appearing at certain times in certain samples. We call that "figging"; it is due to the saponified stearates of the oil dissociating themselves from their humbler friends the oleates, and crystallising, so to speak, into higher society.

Of toilet soaps I might talk till midnight. I have been told that there are five million seven hundred and *thirteen* varieties. I will not vouch for the last thirteen! I will confine myself to mentioning two processes, viz., (1) the re-melting and (2) the milling process. The ordinary twopenny soap—the common or oil-shop variety—I do not disparage. It is often very good; is made by re-melting yellow and curd soap, adding colour and scent. In large works the hot soaps are taken from the big pans and coloured; this saves time, steam, and handling. The finished soaps—honey, brown windsor, etc.—are cooled in small frames, and then cut by wires and stamped by hand presses, after having been dried in drying cupboards, preferably by warm and filtered air. The milling process is now practically universally adopted for the higher class of toilet soaps, because—and this is important—soaps so made do not warp or twist or shrink, and therefore do not spoil expensive wrappers. A pure neutral scentless white soap is chosen for the base. It is dried to the last possible degree; chipped or flaked by machinery, and then ground in heavy granite or steel rollers, running at different speeds, so that No. 2 picks the soap off No. 1, and so on. There are usually five in a mill, and when the soap comes to No. 5 it may be either turned back to No. 1 or turned out into the next machine—the squeezer (French *boudineuse*). Here a powerful screw compresses the ground mass through an orifice into a solid bar of any convenient shape ready for cutting into tablets. But I forgot to tell you that in the mill, cold though the soap is, it has been thoroughly mixed with scents, and, if needed, colours. This cold mixing saves scent from destruction, and the resultant product is far more delicate. Always be sure to select milled toilet soaps; I will endeavour to show you how at the end of this paper.

3. SOME PROBLEMS AND BY-PRODUCTS.—Of course, the ever-present problem is how to keep down expenses so that one's product will compare favourably in price with that of competitors, and it was in endeavouring to attain this end that the various processes for the recovery of glycerine, now universally adopted, were found out. If I had the value of all the glycerine which has been run down the drains in past years I should not envy Andrew Carnegie himself. I expect I

should have given you a library, building and all, to-night, instead of this humble effort. The spent lyes, which we left in a convenient tank, containing 3 per cent. to 5 per cent. of glycerine and about 7 per cent. to 10 per cent. of salt, are treated with acid and then filtered to remove silica, iron and alumina, all of which impurities must be carefully eliminated. They are then concentrated, preferably in double or triple effect vacuum plants. We were the first to adopt Foster's patent plant, made by Fullerton, Hodgart, Barclay & Co., of Paisley, which is now in almost universal use. Many thousands of pounds' worth of other plants have been scrapped to make room for this one.

As the liquor concentrates in the second vessel, in which the vacuum is kept to about 28 in., the salt continually precipitates, and this fact was one of the most difficult to contend with. The late Mr. Foster, who was an expert in sugar machinery, invented pumps to eject the wet newly-precipitated salt. Oh, those pumps! He and I had a worse game with them than a beginner has with a golf ball. He said he had learned more about salt in one evening at the pumps than in all the rest of his life. The salt has a habit of freezing on to iron like barnacles to a ship's bottom. Imagine the work of piston-rods thus coated, and the average life of packings! Well, we scrapped the pumps, and now use an ingeniously planned bulb to collect the salt at the bottom of the second vessel. This bulb has sighting glasses to show the depth of salt and a large cock at the top and bottom. The lower one cannot be opened until the top one is shut. The wet salt is run down into a hydro-extractor, the bulb closed tightly, and the air completely exhausted by opening a pipe leading to the air pump. When the gauge shows 28 in. the top cock may be again opened, and a fresh batch of salt precipitates. The dry salt is conveyed back to the soap house and used over and over again. The glycerine as turned out of this evaporator is crude. It contains 80 per cent. of glycerine and about 10 per cent. of salt. It has to be triple distilled before being called chemically pure, and to attain a really chemically pure glycerine arsenic must be most carefully avoided in any materials used in the soap manufacture or in the subsequent treatment of the glycerine. A problem of considerable interest is how best to obtain the glycerine from the fats *before* saponification. By so doing a pure glycerine is obtained, and the expense of refining is greatly reduced. But the objection to all processes for this purpose which I have seen up to the

present is the tendency for the fat acids to oxidise, or to lose colour, by combining with iron during saponification. Another problem has always been how to avoid scraps. George H. Lorimer, in *Old Gorgon Graham*, says: "There are two breeds of little things in business—those that you can't afford to miss, and those that you can't afford to notice." This is one of the former. Men will soil soap or cut it wastefully, or drop a tray of tablets in the mud. These have to be carefully wiped and then re-boiled—scent, labour, colour, all wasted, and double steam used. That's where good foremen come in; but the really responsible ones for watching these economies are those at the top. If I may again quote Lorimer: "You don't need to bother very much about the things that are going all right, but you want to spend your time smelling out the things that are going all wrong and labouring with them till you've persuaded them to live a better life." Mistakes in delivery are by-products which must be eliminated if profits are to be made. If a man orders a nice rose-scented toilet soap, and promises his wife a tablet, when delivery is made he is apt to write a sarcastic post-card if the parcel opens out to be hospital carbolio soap!

4. THE CONFECTIONERY OF SOAP-MAKING.—A few years ago soap was sent out in quite a crude or rough and ready manner. The household soap used to be packed in any size second-hand boxes, as much as possible was got into the box, and it was invoiced gross and tare. Nowadays boxes are made to hold net weights, and in many factories, even for the cheaper soaps, very elaborate box-making machinery exists. One well-known household soap is sent out entirely in tongued and grooved boxes with dove-tailed corners. Household soap is also now to a very large extent wrapped and packed in card boxes of from one to three tablets, for the convenience of the purchaser. But it is in toilet soaps that the expensive development of confectionery has been so marked in the last few years. I can remember when the greater bulk of English soap-makers thought that from fifteen to twenty different essential oils for scenting was a large assortment. Nowadays the number would be nearer 150. Thirty years ago the small square tablets of brown windsor soap, packed in a 7-lb. wooden box, were good enough for Royalty; nowadays there have to be three or four wrappers or circulars under an elaborately litho'd outer wrapper, and the box must be a casket. I shall show some illustrations of this at the close of the paper. There is one



thing that would interest you, and that is a process for marking soap, so that so long as the soap is in use the marking may be read. If you dip a pin or needle into colour and stick it into a tablet of soap you will find that the pin is cleaned, but that no colour enters into the depth of even a fraction of an inch of the soap tablet. Inventors have spent thousands in endeavouring to overcome this difficulty, and eventually a process was discovered of perforating the soap with arranged needles in a bath of liquid colour. When the needles are withdrawn a vacuum is left, and the air pressure forces the colour right through the depths of the hollow which the needles have made. Any words can be arranged, limited only by the space at command. This invention has innumerable uses. Hotels, railways, clubs, and steamships—where, I am told, petty pilfering is very rife—can have their soap marked with a name or device which will be legible as long as a fragment remains. Again, these tablets can be used to advertise anything, from whisky to a temperance tract, and the lettering in no wise interferes with the quality. Moulds, again, are an elaborate form of confection. We had a set of moulds made for a high-class toilet soap which cost nearly £100 for the one sort only. Now why is it that an Englishwoman says that an English toilet soap at one shilling a tablet, however well confectioned, however delightfully scented, is too dear, but she will pay from 2s. 6d. to 5s. for the French or Belgian variety?

5. ENGINEERING IN RELATION TO SOAP-MAKING.—I asked Mr. Bertram, a member of your Institute and a man of varied experiences, who is adding to them by running the engineering department of a soap works, to give me a few notes on this subject. They are so interesting that I quote them *in extenso*:

“Soap-making presents a great number of interesting problems to the engineer, such as the handling of acids and alkalies, the mechanical conveyance of fats and oils, and the manipulation of the soap itself. In the case of acids, lead or earthenware pipes are the present means of conveyance, and require special care in jointing and special support. Alkalies do not affect metals so strongly as acids, but their action on wood and brickwork entails constant vigilance as to the condition of floors and walls. The conveyance of fats through pipes requires consideration, as, if the fats are heated to make them run freely, chemical changes may take place, and if not warmed sufficiently they solidify in the pipe. In the making of bar soap there

seem to be traditions which bar the way to a more rapid production. It is deemed necessary that the bar should show a grain, though how that affects its washing properties it is hard to determine. There is a possibility of pumping the soap directly from the pan, through a water-cooled pipe, into a squeezer, and producing the hard bar at once. There are openings for invention in stamping soap, and a *simple* wrapping machine would soon pay for itself. Electricity, which can be applied cheaply to mechanical processes, has not yet been used to boil materials on a large scale, though the West Ham Corporation are supplying current at 2d. per unit for domestic cooking purposes, and I have no doubt that in the near future methods will be found of boiling cheaply by this means. The saving to a soap-maker is not to be measured by the coal bill alone, but by the boiler and bunker space saved, by the cleanliness gained by the abolition of pipe lines, and by the reduction of the small army of attendants."

I believe the Institute of Marine Engineers is at present deep in the subject of standardisation, and I think a standard size in soap-making would be of material benefit to us, for we have so many sizes of bars that stock must be kept uncut until we know what size bar is required. With regard to the first part, it seems impossible to make a soap such as is loved by the housewife of England—a yellow soap with a wavy grain or "feather," as it is called in the north of England—except by the first process described. And you all know that "the hand that rocks the cradle is the hand that rules the world." So as long as the British matron requires this class of soap, unless a way of quickly producing it can be found, it will have to be produced slowly. With regard to standardisation, I think that public opinion will do much, and that the full pound as sent out from the factory will be *facile princeps*. But soap will dry, however well made; therefore the maker cannot guarantee that the consumer will buy a full pound. I offer a prize of one guinea for the best suggestion for a solution of this problem.

6. THE SELLING OF SOAP.—In the dim long ago, I am told that people bought things only on their merits, and that honest goods at fair prices would always sell. 'Tis not thus to-day. Granted that you can only sell honest wares, and that you cannot expect for long to sell at higher prices than your competitors, the fact remains that the public buy what is known, what is talked about, what is advertised. In this connection I must speak of the office. As the laboratory is, to my mind,

the embodiment of the senses of a business—the eyes, nose, ears, and mouth—so the office seems to me to be the nerve centre. It must be in touch with the works, the travellers, the directors, and the foreign agents, and it must keep all these varied interests in close touch with the wholesaler, the retailer, and, lastly, the public. An up-to-date business is run by the public through its directors and its office. The works may say, “We can’t do this or it would be cheaper to do that.” The public say, “Blow the expense, we want it.” The directors and managers must buttonhole the works and say, “See here, old man, it’s got to be. Can you say how? Or shall we?” The work’s man goes away sorrowful, but comes back beaming. “If so-and-so were done it could be done, and cheaply.” Then there is peace and the great public gets what it wants, and the office gets orders and the works are busy, and the hands work full time, and the public, if it hold shares, stands a chance of earning dividends. Yes, but that is not quite all. You have to let the public know this, and here comes in the work of the publicity department. Here, originality, brightness and versatility are the prime necessities. A big advertiser once said, with regard to his particular product, “For every £1,000 I have spent, the next man will have to spend £5,000.” And he was not far wrong; the only alteration is that the other man might spend the same amount but to better effect, and this I hold always to be possible. For instance, take magazines. The now almost daily birth of a new magazine is heralded with a big splash of publicity. You would think it hardly possible to get a new idea, and yet only last week a publisher woke up with the startling idea—Would it not be cheaper to give the first number away!

It sounds like a platitude to say so, but there are more ways of advertising than in the Press or on the hoardings. Take bazaars—these wells of pure charity. Not a day passes but we are inundated with imploring, bullying, or cajoling appeals to give goods for deserving objects, the usual-bait, generally in a postscript, being, “We will display your advertisements.” We cannot give to all, so we often offer to sell a cheap assortment which will realise a good profit. This reminds me of a lady who in reply sent a remittance for a ten shilling set. After the bazaar she sent us a further cheque for about thirty shillings, saying she thought this was what the goods had realised, but if it was not enough we must let her know. How she thought her charity was to benefit we failed to see, so we politely returned the second remittance. I should

divide advertisers into three classes—(1) those who employ *bullion*; (2) *persistence*; (3) *originality*. There is success in either method. The first is possible only to the few, the second to all, and the third only to those who make advertising a speciality. In these days specialising is the only real road to success. Whether you be an engineer, a hawker, a physician, or a soap boiler, you must specialise. Look at the success of your president, the Hon. C. A. Parsons, who specialised in turbines; or Edison, in inventions; or, again, Marconi. They are like the plums in sailors' duff—few and far between, but they stick out when you come to them. The universal provider deals in more commodities than other people, but specialises in getting just what is wanted promptly. While on this subject I must tell you of one matter very interesting to the advertiser—namely, trade names. Suppose you advertised Jones's cucumber hair-wash; say, spent thousands on it this week. Next week Smith, Brown and Robinson would be selling cucumber hair-wash. So you must start by registering a name. Here the law comes in. You know what Mr. Bumble said about the law. Well, the law, among other things, says, "Thou shalt not register any name which is descriptive, geographical, a mis-spelling of a word in common use, or a proper name unless by consent." There are a few more difficulties; but that's another story. Now try to think of a new word registerable for a toilet soap, all names of flowers being barred in this particular class. The fifteen puzzle in its youngest days was a fool to this one, yet it is done, and done every day. I once put up for the membership of a club. There were a group of friends round me, and the secretary filled up the form—name, address, then qualification. I said "*Soap maker*," but he filled it up "*Literary*." There's a testimonial for the trade! I am afraid I have rather wandered from the straight path of my subject, but, after all, if soap were not sold it could not be made, unless to be given away with a pound of tea. Which reminds me of another branch of advertising, and that is "giving away." It has been said it is folly to believe that you can get something for nothing. This is probably true with regard to the community, but not with regard to the individual. In these days those who trouble to follow the advertiser *can* get anything, from a toothpick to a gramophone, a bicycle, or, I should think, even a white elephant. (I have heard that some of the watches given away might be so described.) I shall conclude by a brief reference to a most important subject.

7. THE TREATMENT OF EMPLOYEES.—All blame and no praise makes work a heavy burden. Good work is more often got by a pat on the head than by a smack in the eye. But with the *suaviter in modo* must be combined the *fortiter in re*. You have to rate a man when necessary, but not too often; fire him sooner than let him spoil both your temper and capacity for calm work. To quote Lorimer again, "The first banana skin that a lot of fellows step on when they are put over men, is a desire to be too popular. Of course, it's a nice thing to have everyone stand up and cheer when your name is mentioned, but it is mighty seldom that that happens to anyone until he's dead! You can buy a certain amount of popularity anywhere with soft soap and favours, but you can't buy respect with anything but justice, and that's the only popularity worth having." To run a manufacturing business rightly, you must exact punctuality, honesty, and regularity; but you ought to reward enthusiasm. From the office boy to the head clerk, from the stable boy to the manager, each can help or hinder. Good prose is often akin to good poetry, and I think the prosy business of soap-making, if attuned by the key of enthusiasm, is more like a poem than many would imagine.

I will now proceed to illustrate a few points in the paper just read. We have here a large vessel containing distilled water. To show how extremely delicate some of the tests are for free alkali in soap, we will add to this distilled water a drop or two of phenol-phthalein. We have also a small bottle containing a few drops of caustic soda solution; we touch the point of the stirrer with the latter solution, and stir the distilled water and phenol-phthalein, which, from being colourless, becomes a beautiful bright pink colour. Next, I have a piece of quite neutral soap, which does not contain a trace of either free caustic or free carbonated alkali. We rub on its surface a few drops of phenol-phthalein and some nitrate of silver, and let it stand; no discolouration will take place, as I will presently show you. We next have a piece of soap with no free caustic, but a trace (about .01 per cent. of free carbonate of soda) of the solution on being applied to its surface very quickly turns pink. We have another piece of soap containing no free carbonate, but a trace of free caustic soda. A few drops of nitrate of silver in solution very quickly turn brown on being applied to its surface. This is to show how easily our laboratory can detect with these delicate tests any slight divergencies from that which we aim at—absolute purity and absolute neutrality.

I will now show you illustrations of the old-fashioned bar of household soap, weighing nearly 7 lb., and awkward to handle; the old-fashioned box of brown windsor toilet soap, roughly-cut tablets, hand-stamped. Contrast these with the modern packing and wrapping of toilet soaps, with their beautiful litho work on box and wrapper and delicate moulds, and the modern way of packing household soap equally luxurious, from one to three tablets wrapped each in its own wrapper, and packed in a separate cardboard box; each tablet moulded into twin pieces, ready for cutting into a convenient-sized piece of soap, with rounded edges ready for the wash. I have here a silver casket containing three pieces of toilet soap; if these caskets were retailed their price to the retailer would be about £1,500 per gross.

These I now show you are toilet soaps named "Throne" and "Riviera," while for household use there is the "Lightning Soap," but the varieties are many according to the service and purpose. The antiseptic soap for hospital use, as its name implies, is medicated for special use.

The next thing I have to show you is a tablet illustrating a novel way of marking soap, so that the printing may be read as long as the tablet may be in use. This is effected by immersing the tablet in an emulsion of insoluble colour. Needles set up in the form of the lettering which is required to be marked in the soap penetrate half through on either side, and are then withdrawn, leaving a number of small holes—each a vacuum—which suck in the fluid colour. The colour, being insoluble, is harmless to the skin, and sets to about the consistency of the soap. These tablets are largely used by steamship companies, hotels, restaurants, etc., and they are also of great use as an advertising medium. Tablets costing a penny or twopence, while in use for many weeks, will advertise any article, provided always that you cannot use very many letters for this style of advertising.

I also show you the difference in appearance between a "milled" soap and a "boiled" soap, as referred to in my paper. On cutting with a penknife either end of a tablet of "milled" soap you will notice that it cuts away with a granular breaking, and leaves a hard polished surface beneath. The "boiled" soap cuts more like cheese, but, of course, this all depends on the age of the boiled soap. The importance of using "milled" soaps for the toilet is that in this process a super-creaming or super-fatting material may be introduced, which either saves in the process of washing the removal of the natural grease from the skin, or assists in replacing this when removed with the

dirt. A "milled" soap, too, is absolutely homogeneous, can be scented with more delicate perfumes, and keeps its shape for any length of time.

In conclusion it may interest you to hear that we can stamp soap in an innumerable number of sizes; the largest size we send out stamped is, as a rule, not larger than two to the hundredweight, but I have here samples of soap tablets which go from between 7,000 to 8,000 to the hundredweight. I shall be pleased to answer any questions which any of the audience may like to ask.

Mr. G. W. NEWALL said the lecture had been most interesting. For many years he had been searching for a recipe for making soap bubbles, and perhaps the lecturer would be good enough to assist him in getting a solution for soap bubbles that would last from twenty to thirty minutes. Some eight or ten years ago, at the Institute conversazione held in the Town Hall, Stratford, a series of experiments were shown in soap bubbles by Professor Boys. Many of those present would no doubt remember the occasion. Some of the bubbles, about 12 in. to 14 in. in diameter, were displayed and remained for quite ten minutes. Some were blown with oxygen gas, then fitted with light metal rings with three silk cords, attached to which was a paper car, which, when released, floated to the ceiling like a miniature balloon; and, further, many would remember that some bubbles were blown by air, and afterwards a second bubble was blown within it but filled with hydrogen gas, which caused the second and smaller bubble to float up against the inner top side of the large one, whilst a third bubble was blown inside the large one containing  $\text{CO}_2$ , which sank to the bottom inside the large bubble, the whole of them resting on a soaped ring fixed to the table. These experiments the speaker had tried for years to imitate, and always failed for want of a solution that would hold up a soap bubble for at least twenty minutes. He had tried various solutions of all the soaps he could lay his hands on; in fact several times he had collected bottles and vessels galore with soapy water and glycerine in, but to no purpose. The best results he had obtained was from the use of Castile soap and glycerine, but could not reproduce the experiments as seen at the Town Hall by Professor Boys. He had promised to give a small demonstration on soap bubbles, but at the last moment, for some reason, the solution used became poor or was decomposed, so that the results were not as successful as those he

had a few days previously from the same solution. If the lecturer could in any way assist him he should feel extremely obliged, as a demonstration would be given at the Institute on some future occasion.

Mr. COOK replied that he should be very pleased to let Mr. Newall have such a mixture if it could be obtained at all at the works.

Mr. NEWALL further stated he had searched many chemists' shops for various soaps, and when expressing what they were required for, many of the shopkeepers appeared to think he was somewhat wanting. Besides his attempts to obtain a soap bubble from soap and glycerine, he had gone into mixtures dealing with india-rubber solutions, and various gums and varnishes, but to no purpose. Unless a bubble would remain a good strong, healthy bubble at least eight to ten minutes it was not much use trying to form balloons or inflate other bubbles inside of them containing various gases. Besides soap-bubble making, thin films could be experimented with, producing many beautiful colours, and these could be thrown on to a screen; also experiments to prove the strength of various solutions could be tried by making a film on a ring, placing a soaped paper on it, and loading the paper until the film should break, when, on weighing the load, much surprise was often expressed at the weight such films could carry, and so on; an endless number of small experiments could be carried out with what was often looked upon as simply a childish amusement.

Mr. W. McLAREN (Member) said: Would Mr. Cook kindly let us know what properties are in soft soap that make it such a good lubricating agent, especially on fired guides—that is, heated friction surfaces caused through some defect with the oil lubricant, or neglect, the soap in its solid state being applied with a water spray? You also get the same effectual results from white lead.

Mr. COOK replied that soft soap was an extremely valuable lubricant, as it not only lubricated, but, owing to the certain amount of water that it contained and with which it was mixed for this purpose, it had a tendency to keep the lubricated part cooler than ordinary lubricants would do.

Mr. W. C. ROBERTS proposed a vote of thanks to Mr. Cook for his very interesting lecture. This was cordially agreed to.

A vote of thanks to the chairman terminated the proceedings.