wetted, they do not really act by solution-currents, for the latter can only be produced by a dry body. The action here is an indirect one by intervention of the deeper layers.—*February* 26.]

VI. *Behaviour of the surfaces of solutions.*—The effect of soluble matter on the surface tension has absolutely nothing to do with the change which the cohesion of the water undergoes, through matter dissolved in the body of the liquid, for both sugar and soda solutions have a *higher* maximum tension than pure water, and yet these same substances introduced into the surface produce a fall in the separating weight.

In order to investigate the behaviour of the surfaces of solutions more closely, I introduced a saturated solution of common salt into the adjustable trough. The freshly formed surface of the solution of salt maintained its normal separating weight, (1·154 of that of water) even when most contracted, though it must necessarily have contained as much salt as the interior of the liquid. The entrance of the anomalous condition, then, does not depend on the absolute quantity of the contaminating substance contained in the surface; but when I placed some salt in contact with the normal surface of the saturated solution, it gave a solution current and lowered the tension, as in the case of pure water. I obtained similar results with a solution of sugar. From these experiments I concluded (*a*) that the surface layer of water can take up *more* of soluble substances than the internal liquid; (*b*) that the surface of a solution is capable of becoming anomalous under contraction, always and only, when it contains more of the dissolved substance than the interior of the liquid.

That the surface layer really possesses a higher dissolving power is further shown by the experiment, which is well known to you, in which a thin disk of camphor, so hung that it is half immersed in the cleanest possible water surface, is cut through in the course of a few hours. I will add by the way, that a newly formed surface of a saturated solution of camphor is *normal* according to my observations, *i.e.* that its tension remains nearly constant under contraction, and that small pieces of camphor floating on it still give solution streams and have slight motions. The solution stream seems in this case to cease just when the surface begins to be anomalous.

What I have further observed regarding solutions in the surface and the like, seems to me less remarkable, and part of it still very uncertain. I therefore confine myself to these short indications, but I believe that much might be discovered in this field, if it were thoroughly investigated. I thought I ought not to withhold from you these facts which I have observed, although I am not a professional physicist; and again begging you to excuse my boldness, I remain, with sincere respect,

Yours faithfully,

(Signed) AGNES POCKELS.

Modern Views of Electricity.

DR. LODGE's doctrine of the slope of potential, explained in his note to my letter in NATURE of February 19 (p. 367), still presents great difficulties. A plate of zinc is covered by a film of air or oxygen in a different state from the surrounding atmosphere. We first consider a point outside of the film. Dr. Lodge says this point is influenced by the ordinary dielectric strain of a static charge imparted to the zinc in any adventitious manner. That is evident. Now, when the zinc was isolated, we had a negative charge upon it, or in the film, and therefore, at the point in question, a positive slope of potential upwards from the zinc. Call it R. When we make contact with copper we introduce a positive static charge on to the zinc. The effect of this at the point in question is a negative slope of potential—that is, downwards from the zinc. Call it $-R'$. Then, as the final result we have an upward slope of potential, $R - R'$, which is less than before contact was made.

Dr. Lodge further says that the static charge imparted to the zinc does not alter the slope of potential *within the film*. By that, I understand the average slope of potential over a line drawn from end to end of the film at right angles to the zinc. Now if the new static charge—suppose σ per unit of surface—be placed close upon the zinc, so as to have the film outside of it, it will diminish the upward slope of potential at all points within the film by exactly $2\pi\sigma$. If we are at liberty to place the new static charge at some distance from the zinc, we may modify this result in any way we please.

Mr. Chattock suggests that the essence of combination between zinc and oxygen is that the zinc atom is + and the oxygen −. By this, I understand him to mean that two atoms of zinc assume equal and opposite charges, and two atoms of oxygen assume equal and opposite charges; and then positive zinc combines with negative oxygen, forming a neutral compound as regards electrification; but the remaining zinc is negative, and the remaining oxygen positive; hence the step of potential from zinc to oxygen. But how would he explain the permanence of these states of electrification?

S. H. BURBURY.

The Flying to Pieces of a Whirling Ring.

HAVING had occasion lately to devise a high-speed whirling-machine, I examined the speed at which it might be safe to work, and some of the results surprise me. For instance, it is easy to show (by equating the normal component of the tension to the centrifugal force of any element) that the critical velocity at which a circular ring or rim of any uniform section will fly, unless radially sustained, is given by $T = v^2\rho$, where T is the tenacity, and ρ the density of its material. Thus a band of steel just able to bear a load of 30 tons to the square inch will fly to pieces at a peripheral speed of about 800 feet a second; and this without reference to its angular velocity, or radius of curvature. It may be objected that no such accident could occur with purely rectilinear motion, but such motion at the critical speed would be very unstable—the slightest shiver of a vibration running along it would precipitate a catastrophe.

Hence a steel girdle round the earth's equator would burst, however thick it might be, were it not for its weight. Again, an Atlantic cable is only held together by its weight. In the early days of cable-laying, it was suggested to ease matters by attaching floating matter to the cable till it was of the same average density as sea-water; but we now see that such a cable, if lying parallel to the equator, could not hold together, unless it were made of 30-ton steel and laid north of latitude 60°.

OLIVER J. LODGE.

Cutting a Millimetre Thread with an Inch Leading Screw.

IT is possible that many who possess a screw-cutting lathe with a leading screw of so many threads to the inch may wish to use it for cutting millimetre screws. While, of course, it is too much to expect that the absolute value of the millimetre, as given in terms of the inch, can be obtained by ordinary change wheels—and this is not of great importance, since, among other reasons, the two determinations of the value of the millimetre in inches differ by one part in a hundred thousand—yet it may not be well known that a most remarkable degree of accuracy may be obtained with wheels in ordinary use. After some trouble I lighted upon the following numbers, which, with a leading screw of eight threads to the inch, give as a result 25·3968, whereas the inch is 25·3995 millimetres. The wheels are 28 on mandril, 100 and 36 on stud, and 32 on screw. The error would therefore, with a perfect lathe, be less than one part in nine thousand, so that a screw cut in this way would for almost all purposes be correct; in fact, it is doubtful if in the case of short screws many lathes could be trusted to cut inch threads more accurately. For leading screws of other pitches, such as 4, 5, 6, or 10 threads to the inch, the wheels can easily be altered so as to give the same result.

Of course it may be the case that this or an equally good arrangement is known to some; but as I had to start working out the combinations of thirteen wheels taken four together, in which each combination contained six sub-combinations, in order to obtain the result, it is possible that it may be appreciated by those to whom it may be of use, but who would rather be saved so much trouble.

C. V. BOYS.

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P.S.—It may be worth while to add that the wheels taken in order—

	28 ...	*100* ...	36 ...	*32*	with	*8*	threads to the inch
are the same as	28 ...	*32* ...	36 ...	*100*	,,	*8*	,, ,, ,,
or as	7 ...	*8* ...	9 ...	*25*	,,	*8*	,, ,, ,,
or as	7 ...	*8* ...	9 ...	*10*	,,	*20*	,, ,, ,,

where the followers or multipliers are printed in italics. The