strokes. These precepts and a few minor ones have been easily followed in all cases. I inclose a few lines copied from your interesting journal by a youth who does not understand English: he would have done this work with more care had he known that I wanted merely a sample. At all events it is most easy to read.

Straight letters without hair lines give the reader a comfortable facility which is a far greater compliment to a correspondent than the "dear Sir" imported from England to France during the last fifty years. We suppose that slant writing has been invented on your side of the Channel, and we call it therefore *écriture anglaise*. However, experience seems to show that it is more easily deformed than a straight one, and that it degenerates often into an illegible scrawl, causing much loss of time, or even, what is worse, a tiresome amount of perplexity and worry. We are told that the schoolmaster is abroad, but I am afraid that he leads our children on a false trail far away from the main aim of writing, which is *legibility*. Is the invention of type-writers the antidote or the outcome of illegible slants? Some of your philosophers may answer this question while giving a wholesome lesson to the schoolmaster.

A. D'ABBADIE (de l'Institut).

Abbadia, Hendaye, France, August 16.

Cordylophora lacustris.

IN NATURE for June 4 (p. 106) Mr. John Bidgood recorded the presence of this Hydrozoan in vast numbers on submerged roots and stems in the Ant, Bure, and Thurne. Till then its only known Norfolk locality was that given in Allman—"an agricultural drain near Lynn Regis." This summer innumerable colonies were to be seen on weed floating on the surface on both sides of the Thurne from Ludham Bridge right up to Hickling Broad. A boatman told me he had seen "them insects" every summer for many years past. Mr. Edward Corder, the Secretary of the Norwich Natural History Society, took some early in June, and some, which he was good enough to send me, is still living in a 4-ounce bottle. All the authorities state that Cordylophora is a "light-shunning animal," and the localities hitherto recorded certainly warranted such a conclusion. But the colonies taken from the surface of the water by Mr. Corder, and those I took some time later, were stronger and cleaner than those obtained from below the surface. I distributed some of the gathering which I brought back to London, and learn that it is all doing well in ordinary aquaria. Some that I sent to Mr. Bolton for distribution unfortunately died in transit. One large colony, some eight inches long, on the stem of a Potamogeton, was kept in the shade for a fortnight; the tubes became flaccid, and the hydranths pendent, but they revived within twenty-four hours when exposed on the ledge of a window with a western aspect. This seems to point to a change of habit. All the colonies were doubtless founded below the surface of the water, and the weeds, when cut to clear the fairway for wherries, were floated up towards Hickling Broad by the tide. But if reproduction takes place—as it certainly does—under these conditions, is it not probable that we shall have a race tolerant of direct light, if not as sensitive thereto as *Hydra vulgaris*?

HENRY SCHERREN.

5 Osborne Road, Stroud Green, N., September 3.

Absolute and Gravitation Systems.

THE present condition of things is such that students of engineering need familiarity with, and ability to use, both systems of measuring force and related quantities. It seems necessary, therefore, that the transition from one system to the other should be kept clear of complications, and be presented as the simple matter which it really is. But in two text-books which have come to my notice, each offering points of excellence, and both evidently written by competent hands, a change in the unit of mass occurs in passing from the absolute to the gravitation system. The unit-mass is defined as the mass in which unit-acceleration is produced by unit force, which, of course, gives about 32 pounds as the mass-unit for the British gravitation system.

There is, in my opinion, much that is undesirable about this method of statement; the new mass-unit appears quite artificially in this one only of the many uses of the conception of mass, for the purpose, I suppose, of making it possible to put in

generally applicable form such statements as: "Force is measured by change per second in momentum." My particular objection to it, however is that it locates the point of divergence among the fundamental units instead of among those derived from them. Does it not seem preferable to begin with units of mass, length, and time; to construct derived units, and to make common use of these as far as possible, postponing the differentiation of the two systems till the moment when it actually occurs? Surely it has been pointed out often, since the days of early exposition of these matters by Maxwell, Tait, and others, that the *force-unit* is the first cardinal point of difference, and that the absolute system simplifies here, while the gravitation system adopts another convention, which may be called arbitrary as opposed to the simpler one fixed upon by its rival.

In the hope of hastening the day of agreement in presenting the connection of ideas which underlie so much of modern physics and its applications, I have thought it permissible to state in summary, and for British units, the scheme used in my own teaching of mechanics. The claim is not advanced that the numerical work becomes different; indeed, the appended table is equally valid whichever basis be chosen; but there does seem to be a gain in logical clearness, as well as in what we may call historical accuracy.

Absolute System.—Fundamental units: foot, pound, second. Units of force, work, impulse derived in the usual way, so as to make proportional factors unity.

Gravitation System.—Fundamental units as before. Unit of force, the weight of one pound under circumstances specified to the required degree for scientific definiteness (locality, vacuum). Units of work and impulse connected with the force-unit, so as to make proportional factors unity.

The table shows the matter at a glance. g_1 is the value of g for the standard circumstances, and is to be regarded as a divisor in each case affecting the *product* of the other factors. The other symbols explain themselves.

Absolute.

$$P = mf,$$

$$(\text{work}) \int Pds = (\text{change in}) \frac{mv^2}{2},$$

$$(\text{impulse}) \int Pdt = (\text{change in}) mv.$$

Gravitation.

$$P = \frac{mf}{g_1},$$

$$(\text{work}) \int Pds = (\text{change in}) \frac{mv^2}{2g_1},$$

$$(\text{impulse}) \int Pdt = (\text{change in}) \frac{mv}{g_1}.$$

The choice of force-unit here affects what is logically subsequent to it, as it must; but leaves unaffected what is logically antecedent, as it ought.

So small a change as that of regarding g_1 as a divisor of m alone changes the basis of presentation; but there is an important difference of thought involved.

FREDERICK SLATE.

University of California.

Eucalyptus as a Disinfectant.

IN a paragraph on the use of Eucalyptus branches for disinfection, as recommended by Baron von Mueller, you have unintentionally stated that to be the manner in which I have used Eucalyptus.

For the last two years I have used "Tucker's Eucalyptus Disinfectant" (a solution of antiseptics in the essential oil) in all cases of scarlet fever and diphtheria, and have not had one case of infection. In the former disease I have not used any isolation, and in most cases have not excluded the other children of the family from the sick-room. None of the cases, except two or three that were severe, were kept to their bed-room more than ten days; the isolation of six or eight weeks being unnecessary, as the cuticle is perfectly disinfected. This is accomplished by rubbing the disinfectant over the whole body twice and then once a day for ten days.

Baron von Mueller, in a letter I received from him, quite approves of my method of disinfecting by inunction. I read a

paper before the Epidemiological Society last year on the subject. It is published in the Society's Transactions, and in a separate form by Mr. Lewis, of Gower Street. I also read a paper before the International Congress of Hygiene on antiseptic inunction. In this I have related the experience of other medical men in confirmation of my own. One, whose child had scarlet fever, placed his two other children in the same room, and kept them there for eight days, and they did not take the disease. This will be published in the Transactions of the Congress, and any one interested in the disinfection of infectious diseases, may obtain all the information they require from those two papers.

J. BRENDON CURGENVEN.

Teddington Hall, S.W., August 17.

Alum Solution.

ONE frequently reads, in accounts of experiments on the physical or chemical action of luminous rays, that a *solution of alum* has been used to absorb obscure heat radiations. An instance of this occurs in your description of the investigation by M. D'Arsonval (*NATURE*, vol. xlv. p. 390). I should like to be informed if this practice is based upon actual evidence, or merely upon the supposition that, because alum itself cuts off a larger proportion of heat rays than any other easily available solid, its solution should be more effective than any other liquid. The only figures bearing on the question with which I am acquainted are those of Melloni, and he, as cited by Ganot, states the percentage of heat rays transmitted by alum solution as 12, and that by distilled water as 11. Why, then, not use distilled water?

HARRY NAPIER DRAPER.

Dublin, August 27.

A NEW KEYED MUSICAL INSTRUMENT FOR JUST INTONATION.

ONE of those subjects which periodically turn up for discussion, and then vanish for an interval of neglect, is the possibility of obtaining just intonation in the performance of music. Those who have studied theory, properly so-called, know very well that the series of musical sounds commonly used, as expressed on the pianoforte, do not give the true harmonic combinations on which the art is based, and many zealous attempts have been made to cure the evil. One of these, showing some novelty and much merit, is now exciting the attention of eminent musicians on the Continent; it was mentioned briefly in *NATURE* of April 2 last (p. 521), and it may be interesting to many readers to give some further account of its general features. We may, however, preface this with a few words on the state of the question generally.

Although the equal division of the octave has now taken such a firm hold on modern musicians, it is only within a comparatively recent period that its use has become common. It was well known at an early date, but its defects checked its use until the general introduction of the class of instruments which have culminated in the pianoforte; the reason of its adoption then being that the want of sustaining power in the clavier and the harpsichord so diminished the discordant effect as to make the faulty tuning endurable. People then began to get accustomed to it, and it was soon found that the system gave such extraordinary facilities for chromatic music, that the cultivation of this style became enormously developed. Hence the chromatic style and the equal temperament have become closely allied, and it is almost a matter of doctrine that the pianoforte division of the octave is a necessary element for the proper performance, or proper understanding, of the compositions of modern days.

For organs, the application of the equal temperament came much later. Down to about the middle of this century they were tuned on a system which gave the most usual keys fairly in tune, at the cost of an occasional harsh chord, which, for church purposes, was considered

but a small price to pay for the general smooth and harmonious effect. But when highly skilled players began to increase, they required the organ to be more used for exhibition, and for this purpose the introduction of the equal temperament was deemed desirable. And so, as it thus commanded the two most powerful sources of music, it crept into use also by stringed instruments, orchestras, and voices, and so it has become general.

The consequence is that, now, practical musicians are in the habit of accepting the equal-tempered intonation as genuine and true music; and as the study of the principles of musical structure is by no means highly encouraged in this country, efforts are seldom made to undeceive them. Students are authoritatively told that questions about just intonation may be interesting to physicists and mathematicians as recondite problems in acoustical science, but that they have no bearing on "practical" music, and that, therefore, musicians need not trouble themselves about them. Some years ago, at a meeting of one of our musical educational establishments, it was said, "We do not here make music an affair of vibrations"—a sentiment which was received with loud applause.

No doubt some enthusiasts have carried the investigations on this subject to a degree of refinement which far outruns practical utility; and one can have little sympathy with those who delight in reviling and despising the duodecimal scale; seeing that it has been the means of materially advancing the art, and that the modern enharmonic system, founded upon it, has been so thoroughly incorporated into modern music that it is difficult to see how it could be now ignored.

But, on the other hand, one must, if one is to exercise reason and common-sense in musical matters, be equally at variance with the party who, arrogating to themselves the title of "practical" musicians, force on us the equal temperament to an extent which really means the extinction of true intonation altogether. We now, indeed, never hear it, and in fact only know by imagination what a true "common chord" means.

The principal objection to this state of things is that the ears of musicians become permanently vitiated, and lose the sense of accurate intonation, or the *desire to approach it*, which is tantamount to abandoning the most precious feature that modern music possesses—namely, beauty of harmony. A chord of well selected sounds, exactly in tune, is a very charming thing; but it is a thing unknown to ears of the present day. I can recollect the time when singers and violin-players strove to sing and play in good tune, and the effect of such unaccompanied part-singing, and such violin-playing, was very delightful. But now, music not being made "an affair of vibrations," one is often ashamed of the quality of what one hears; nobody seems to think purity of harmony, either with voices or violins or orchestras, to be a matter worth striving after.

It is surely a reasonable wish that this should be checked, but one must be reasonable in one's expectations. The pianoforte must certainly be let alone, and so must the organ when used for exhibitional purposes, though its cacophony under the present tuning detracts much from the pleasure of hearing such fine playing as is now common. But vocalists and violin-players ought to be encouraged, as of old, to sing and play in tune, and for this purpose what is wanted is an instrument which will keep up and circulate the tradition of what true music means. To attain this, therefore—*i.e.* to construct an instrument which shall enable a player, with moderate ease, to play polyphonic music, of moderately chromatic character, in strict tune—has been the aim of many ingenious musicians and mechanics.

I need not go into history. Everybody may see at South Kensington the wonderful enharmonic organ, built half a century ago by General Thompson, and may read of