"ON A PIECE OF CHALK."—A LECTURE TO WORKINGMEN.

BY PROFESSOR HUXLEY, F. R. S., ETC.

If a well were to be sunk at our feet in the midst of the city of Norwich, the diggers would very soon find themselves at work in that white substance, almost too soft to be called rock, with which we are all familiar, as "chalk."

Not only here, but over the whole country of Norfolk, the well-sinker might carry his shaft down many hundred feet without coming to the end of the chalk; and, on the sea coast, where the waves have pared away the face of the land which breasts them, the scarped faces of the high cliffs are often wholly formed of the same material. Northward, the chalk may be followed as far as Yorkshire; on the south coast it appears abruptly in the picturesque western bays of Dorset, and breaks into the Needles of the Isle of Wight; while on the shores of Kent it supplies that long line of white cliffs to which England owes her name of Albion.

Were the thin soil which covers it all washed away, a curved band of white chalk, here broader and there narrower, might be followed diagonally across England from Lulworth in Dorset to Flamborough Head in Yorkshire, a distance of over 280 miles as the crow flies.

From this band to the North Sea on the east and the Channel on the south, the chalk is largely hidden by other deposits; but, except in the Weald of Kent and Sussex, it enters into the very foundation of all the south-eastern counties.

Attaining, as it does in some places, a thickness of more than a thousand feet, the English chalk must be admitted to be a mass of considerable magnitude. Nevertheless, it covers but an insignificant portion of the whole area occupied by the chalk formation of the globe, which has precisely the same general character as ours, and is found in detached patches, some less and others more extensive than the English.

Chalk occurs in northwest Ireland; it stretches over a large part of France,—the chalk which underlies Paris being, in fact, a continuation of that of the London basin; runs through Denmark and Central Europe, and extends southward to North Africa; while eastward it appears in the Crimea and in Syria, and may be traced as far as the shores of the Sea of Aral in Central Asia.

If all the points at which true chalk occurs were circumscribed, they would lie within an irregular oval about 3,000 miles in long diameter,—the area of which would be as great as that of Europe, and would many times exceed that of the largest existing inland sea,—the Mediterranean.

Thus the chalk is no unimportant element in the masonry of the earth's crust, and it impresses a peculiar stamp, varying with the conditions to which it is exposed, on the scenery of the districts in which it occurs. The undulating downs and rounded coombs, covered with sweet grassed turf, of our inland chalk country, have a peacefully domestic and mutton-suggesting prettiness, but can hardly be called either grand or beautiful. But on our southern coasts, the wall-sided cliffs, many hundred feet high, with vast needles and pinnacles standing out in the sea, sharp and solitary enough to serve as perches for the wary cormorant, confer a wonderful beauty and grandeur upon the chalk headlands. And in the East, chalk has its share in the formation of some of the most venerable of mountain ranges, such as the Lebanon.

What is this wide-spread component of the surface of the earth and whence did it come?

You may think this no very hopeful inquiry. You may not unnaturally suppose that the attempt to solve such problems as these can lead to no result save that of entangling the inquirer in vague speculations, incapable alike of refutation and of verification.

If such were really the case, I should have selected some other subject than a "piece of chalk" for my discourse. But, in truth, after much deliberation, I have been unable to think of any topic which would so well enable me to lead you to see how solid is the foundation upon which some of the most startling conclusions of physical science rest.

A great chapter of the history of the world is written in the chalk. Few passages in the history of man can be supported by such an overwhelming mass of direct and indirect evidence as that which testifies to the truth of the fragment of the history of the globe, which I hope to enable you to read with your own eyes to-night.

Let me add, that few chapters of human history have a more profound significance for ourselves. I weigh my words well when I assert, that the man who should know the true history of the bit of chalk which every carpenter carries about in his breeches pocket, though ignorant of all other history, is likely, if he will think his knowledge out to its ultimate results, to have a truer, and therefore a better, conception of this wonderful universe, and of man's relation to it, than the most learned student who is deep read in the records of humanity and ignorant of those of nature. The language of the chalk is not hard to learn, not nearly so hard as Latin, if you only want to get at the broad features of the story it has to tell; and I propose that we now set to work to spell that story out together.

We all know that if we "burn" chalk the result is quicklime. Chalk, in fact, is a compound of carbonic acid gas and lime, and when you make it very hot the carbonic acid flies away and the lime is left.

By this method of procedure we see the lime, but we do not see the carbonic acid. If, on the other hand, you were to powder a little chalk, and drop it into a good deal of strong vinegar, there would be a great bubbling and fizzing, and finally a clear liquid in which no sign of chalk would appear. Here you see the carbonic acid in the bubbles; the lime, dissolved in vinegar, vanishes from sight. There are a great many other ways of showing that chalk is essentially nothing but carbonic acid and quicklime. Chemists enunciate the result of all the experiments which prove this, by stating that chalk is almost wholly composed of "carbonate of lime."

It is desirable for us to start from the knowledge of this fact, though it may not seem to help us very far towards what we seek, for carbonate of lime is a widely spread substance, and is met with under very various conditions. All sorts of limestones are composed of more or less pure carbonate of lime. The crust, which is often deposited by waters which have drained through limestone rocks in the form of what are called stalagmites and stalactites, is carbonate of lime. Or, to take a more familiar example, the fur on the inside of a tea kettle is carbonate of lime; and, for anything chemistry tells us to the contrary, the chalk might be a kind of gigantic fur upon the bottom of the earth-kettle, which is kept pretty hot below.

Let us try another method of making the chalk tell its own history. To the unassisted eye chalk looks simply like a very loose and open kind of stone. But it is possible to grind a slice of chalk down so thin that you can see through it,—until it is thin enough, in fact, to be examined with any magnifying power that may be thought desirable. A thin slice of the fur of a kettle might be made in the same way. If it were examined microscopically, it would show itself to be a more or less distinctly laminated mineral substance, and nothing more.

But the slice of chalk presents a totally different appearance when placed under the microscope. The general mass of it is made up of very minute granules; but embedded in this matrix are innumerable bodies, some smaller and some larger, but, on a rough average not more than a hundredth of an inch in diameter, having a well-defined shape and structure. A cubic inch of some specimens of chalk may contain hundreds of thousands of these bodies, compacted together with incalculable millions of the granules.

The examination of a transparent slice gives a good notion of the manner in which the components of the chalk are arranged, and of their relative proportions. But, by rubbing up some chalk with a brush in water, and then pouring off the milky fluid, so as to obtain sediments of different degrees of fineness, the granules and the minute rounded bodies may be pretty well separated from one another, and submitted to microscopic examination, either as opaque or as transparent objects. By combining the views obtained in these various methods, each of the rounded bodies may be proved to be a beautifully constructed calcareous fabric, made up of a number of chambers, communicating freely with one another. The chambered bodies are of various forms. One of the commonest is something like a badly grown raspberry, being formed of a number of nearly globular chambers of different sizes congregated together. It is called *Globigerina*, and some specimens of chalk consist of little else than *Globigerinæ* and granules.

Let us fix our attention upon the *Globigerina*. It is the the spoor of the game we are tracking. If we can learn what it is, and what are the conditions of its existence, we shall see our way to the origin and past history of the chalk.

A suggestion which may naturally enough present itself is, that these curious bodies are the result of some process of aggregation which has taken place in the carbonate of lime; that, just as in winter, the rime on our windows simulates the most delicate and elegantly arborescent foliage,—proving that the mere mineral, water, may, under certain conditions, assume the outward form of organic bodies,—so this mineral substance, carbonate of lime, hidden away in the bowels of the earth, has taken the shape of these chambered bodies. I am not raising a merely fanciful and unreal objection. Very learned men, in former days, have even entertained the notion that all the formed things found in rocks are of this nature; and if no such conception is at present held to be admissible, it is because long and varied experience has now shown that mineral matter never does assume the form and structure we find in fossils. If any one were to try to persuade you that an oyster shell (which is also chiefly composed of carbonate of lime) had crystallized out of sea-water, I suppose you would laugh at the absurdity. Your laughter would be justified by the fact that all experience tends to show that oyster shells are formed by the agency of oysters, and in no other way. And if there were no better reasons we should be justified, on like grounds, in believing that *Globigerina* is not the product of anything but vital activity.

Happily, however, better evidence in proof of the organic nature of the *Globigerinæ* than that of analogy is forthcoming It so happens that calcareous skeletons, exactly similar to the *Globigerinæ* of the chalk, are being formed, at the present moment, by minute living creatures, which flourish in multitudes, literally more numerous than the sands of the sea shore, over a large extent of that part of the earth's surface which is covered by the ocean.

The history of the discovery of these living *Globigerinæ*, and of the part which they play in rock-building, is singular enough. It is a discovery which, like others of no less scientific importance, has arisen, incidentally, out of work devoted to very different and exceedingly practical interests.

When men first took to the sea they speedily learned to look out for shoals and rocks, and, the more the burden of their ships increased, the more imperatively necessary it became for sailors to ascertain with precision the depth of the waters they traversed. Out of this necessity grew the use of the lead and sound line; and, ultimately, marine surveying which is the recording of the form of coasts and of the depth of the sea, as ascertained by the sounding lead upon charts.

At the same time it became desirable to ascertain and to indicate the nature of the sea bottom, since this circumstance greatly affects its goodness as holding ground for anchors. Some ingenious tar, whose name deserves a better fate than the oblivion into which it has fallen, attained this object by arming the bottom of the lead with a lump of grease to which more or less of the sand or mud or broken shells, as the case might be, adhered, and was brought to the surface. But, however well adapted such an apparatus might be for rough nautical purposes, scientific accuracy could not be expected from the armed lead, and to remedy its defects (especially when applied to sounding in great depths), Lieutenant Brooke, of the American Navy, some years ago invented a most ingenious machine by which a considerable portion of the superficial layer of the sea bottom can be scooped up and brought up from any depth to which the lead descends.

In 1853, Lieutenant Brooke obtained mud from the bottom of the North Atlantic, between Newfoundland and the Azores at a depth of more than 10,000 feet, or two miles, by the help of this sounding apparatus. The specimens were sent for examination to Ehrenberg of Berlin, and to Bailey of West Point, and those able microscopists found that this deep sea mud was almost entirely composed of the skeletons of living organism.—the greater proportions of these being just like the *Globigerinæ* already known to occur in the chalk.

Thus far the work had been carried on simply in the interests of science, but Lieutenant Brooke's method of sounding acquired a high commercial value when the enterprise of laying down the telegraph cable between this country and the United States was undertaken. For it became a matter of immense importance to know, not only the depth of the sea over the whole line along which the cable was to be laid, but the exact nature of the bottom, so as to guard against chances of cutting or fraying the strands of that costly rope. The Admiralty consequently ordered Captain Dayman, an old friend and shipmate of mine, to ascertain the depth over the whole line of the cable, and to bring back specimens of the bottom. In former days such a command as this might have sounded very much like one of the impossible things which the young prince in the Fairy Tales is ordered to do before he can obtain the hand of the princess. However, in the months of June and July, 1857, my friend performed the task assigned to him with great expedition and precision, without, so far as I know, having met with any reward of that kind. The specimens of Atlantic mud which he procured were sent to me, to be examined and reported upon.

The result of all these operations is that we know the contours and nature of the surface-soil covered by the North Atlantic for a distance of 1,700 miles from east to west, as well as we know that of any part of the dry land

It is a prodigious plain, one of the widest and most even plains in the world. If the sea were drained off, you might drive a wagon all the way from Valentia, on the west coast of Ireland, to Trinity Bay in Newfoundland. And, except upon one sharp incline, about 200 miles from Valentia, I am not quite sure that it would even be necessary to put the skid on, so gentle are the ascents and descents upon that long route. From Valentia the road would lie down hill for about 200 miles to the point at which the bottom is now covered by 1,700 fathoms of sea-water. Then would come the central plain, more than a thousand miles wide, the inequalities of the surface of which would be hardly perceptible, though the depth of the water upon it now varies from 10,000 to 15 000 feet; and there are places in which Mont Blanc might be sunk without showing its peak above water. Beyond this, the ascent on the American side commences, and gradually leads, for about 300 miles, to the Newfoundland shore.

Almost the whole of the bottom of this central plain (which extends for many hundred miles in a north and south direction) is covered by a fine mud, which when brought to the surface, dries into a grayish white friable substance You can write with this on a blackboard, if you are so inclined, and to the eye it is quite like very soft, grayish chalk. Examined chemically, it proved to be composed almost wholly of carbonate of lime; and if you make a section of it in the same way as that of a piece of chalk was made, and view it with the microscope, it presents innumerable *Globigerinæ* embedded in a granular matrix.

Thus this deep sea mud is substantially chalk. I say substantially, because there are a good many minor differences; but as these have no bearing upon the question immediately before us—which is the nature of the *Globigerinæ* of the chalk —it is unnecessary to speak of them.

Globigerinæ of every size, from the smallest to the largest, are associated together in the Atlantic mud, and the chambers of many are filled by a soft animal matter This soft substance, is, in fact, the remains of the creature to which the *Globigerinæ* shell, or rather skeleton, owes its existence,— and which is an animal of the simplest imaginable description. It is, in fact, a mere particle of living jelly, without defined parts of any kind,—without a mouth, nerves, muscles, or distinct organs, and only manifesting its vitality to ordinary observation by thrusting out and retracting, from all parts of its surface, long filamentous processes, which serve for arms and legs. Yet this amorphous particle, devoid of everything which in the higher animals we call organs, is capable of feeding, growing, and multiplying; of separating from the ocean the small proportion of carbonate of lime which is dissolved in sea-water; and of building up that substance into a skeleton for itself, according to a pattern which can be imitated by no other known agency.

The notion that animals can live and flourish in the sea at the vast depths from which apparently living *Globigerinæ* have been brought up does not agree very well with our usual conception respecting the conditions of animal life; and it is not so absolutely impossible as it might at first sight appear to be, that the *Globigerinæ* of the Atlantic sea-bottom do not live and die where they are found.

As I have mentioned, the soundings from the great Atlantic plain are almost entirely made up of *Globigerinæ* with the granules which have been mentioned and some few other calcareous shells; but a small percentage of the chalky mud—perhaps at most some five per cent of it—is of a different nature, and consists of shells and skeletons composed of silex or pure flint These silicious bodies belong partly to those lowly vegetable organisms which are called *Diatomaceæ*, and partly to those minute and extremely simple animals termed *Radiolariæ*. It is quite certain that these creatures do not live at the bottom of the ocean but at its surface,—where they may be obtained in prodigious numbers by the use of a properly constructed net. Hence it follows that these silicious organisms, though they are not heavier than the lightest dust, must have fallen in some cases through fifteen thousand feet of water before they reached their final resting place on the ocean floor. And considering how large a surface these bodies expose in proportion to their weight, it is probable that they occupy a great length of time in making their burial journey from the surface of the Atlantic to the bottom.

But if the *Radiolariæ* and Diatoms are thus rained upon the bottom of the sea from the superficial layer of its waters, in which they pass their lives, it is obviously possible that the *Globigerinæ* may be similarly derived; and, it they were so, it would be much more easy to understand how they obtain their supply of food than it is at present. Nevertheless the negative and positive evidence points the other way. The skeletons of a full-grown deep sea *Globigerinæ* are so remarkably solid and heavy in proportion to their surface as to seem little fitted for floating; and, as a matter of fact, they are not to be found along with the Diatoms and *Radiolariæ* in the uppermost stratum of the open ocean.

It has been observed again, that the abundance of *Globigerinæ* in proportion to other organisms of like kind, increases with the depth of the sea; and that deep-water *Globigerinæ* are larger than those which live in shallower parts of the sea; and such facts negative the supposition that these organisms have been swept by currents from the shallows into the deeps of the Atlantic.

It therefore seems to be hardly doubtful that these wonderful creatures live and die at the depths in which they are found.

However, the important points for us are that the living *Globigerinæ* are exclusively marine animals, the skeletons of which abound at the bottom of deep seas; and that there is not a shadow of reason for believing that the habits of the *Globigerinæ* of the chalk differed from those of the existing species. But if this be true, there is no escaping the conclusion that the chalk itself is the dried mud of an ancient deep sea.

(To be continued.)

ICE MACHINES.

(Continued from page 196.)

Since publishing the former article, a pamphlet has appeared in Germany containing a short description of the modern ice machines, in which, however, the American inventions and improvements, as usually is the case with European publications, are totally overlooked. We possess here a decided avantage over Europe, in the fact that Americans always keep themselves posted about European inventions and improvements, while Europe has not yet come fully to the persuasion of the great importance of our inventions and improvements, and how useful it would be, always to take due notice of them.

We see from the German pamphlet referred to, that five different forms of the machine described by us, have been patented in Europe, the first by Vranken in Cologne and Meller in Essen, a second by Grubeaud, a third by Penant, a fourth by Fouju, and a fifth by Toselli. None of them possess any striking peculiarity or advantage, their differences being of the same mechanical kind as in the different cream freezers so well known in this country, and on which there exist several scores of United States patents. In general they all resemble our cream freezers, of which many could be used for ice machines of this description; perhaps some of them have already been patented in this country as such.

We will only add a few more freezing mixtures to our list, page 196:

MIXTURES.	PARTS.	DESCENT OF THERMOMETER.
Carbonate of Soda	1	70° Fah.
Nitrate of Potash	1	
Water	1	
Chloride of Ammonium	1	68°
Water	1	
Sulphate of Soda	3	72°
Water	[illegible]	
Nitrate of Ammonia	1	50°
Water	1	

As these mixtures are made simply with water, and not with acids, the ingredients may be regained by evaporation and recrystallization of the salts, and therefore they are much less expensive than the solutions in acids, mentioned on page 196. It is curious that also here heat must be employed in order to return to the salts their cold-producing qualities, and in this sense the chemical ice machines described are related to those of the second class to be described next week, which operate entirely and solely by the previous application of heat.

The different makers of these machines recommend special solutions, according to the amount of success they obtained with them, in their machines. So the chloride of ammonium, saltpeter, and water (page 194) is recommended by Vranken; by Grubeaud, nitrate of ammonia, and water (see above); Penant recommends hydrated glauber salts and muriatic acid (hydrated sulphate of soda and hydrochloric acid); Toselli recommends crystallized soda and ammoniacal salt (he means probably carbonate of soda and nitrate of ammonia, or chloride of ammonium, or sulphate of ammonia, which are cheaper than the nitrate of ammonia.)

In order to be successful in these manipulations, they must be made with as large quantities as possible, the different salts must be well powdered, and, as well as the liquids used, be cooled before hand as much as practicable, the mixing of the ingredients must be done as rapidly as possible, and great care taken that no heat can be absorbed anywhere, except from the water to be cooled or frozen.

One more point must be observed in relation to this method of producing cold. When the salts are too dry, no cold will be produced, even heat, as in place of liquefaction, at first a solidification of water in the salt will take place, which of course in solidifying will set its latent heat of fluidity free, the same as takes place in pouring water on quicklime, which is anhydrous lime. This is illustrated in the cooling method of Berzelius, described on page 196. When the chloride of calcium* is too dry, as is the case with the fused anhydrous substance, it will commence with absorbing water, and solidifying it, to form first a hydrate. The heat thus produced in some portions, may counterbalance to a considerable extent the cold produced by other dissolving particles; from there the prescription of Berzelius, to let the salt, by powdering it and passing it through a sieve, absorb water from the atmosphere, previously to using it.

*On page 196, lines 23 and 31, in mentioning chloride of lime, we intended not the hypochlorite of lime, or bleaching powder, which is commonly erroneusly called chloride of lime, but we intended the above chloride of calcium, made from lime and hydrochloric acid.

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

"What Makes the Difference?"

MESSRS EDITORS.—An article which appeared in the SCIENTIFIC AMERICAN, of Oct. 14th, commenting upon the difference in social position, pay, etc, of mechanics and clerks, does not seem to me to touch the real point of the subject discussed.

In the first place, labor, *per se*, is not degrading, nor is it generally considered so, but many men working as mechanics do not take the pains to qualify themselves for social position. They affect to despise the points of etiquette, and other things considered essential in society, and cry out against them. There is no reason why a man working only ten hours per day should not have abundant time to study and perfect himself in all the rules of conduct for the best society, as it is called, that is the society of educated and refined people.

A young man who takes a little care to learn, and practice the rules of good society, and read works of a character tending to elevate and improve his mind will find plenty of opportunities for associating with people of the so-called first circles. In the circle of my acquaintance I know of many persons, who started in life as working mechanics who are now leaders of society, and I know others, having abundant means, so far as bare money is concerned, to gratify every desire and move in the highest circles, who are content to grovel along without any social intercourse, so to speak. It is not wealth alone that gives the entrée to refined circles, but it is mind, and the attention to points of etiquette which have become established in the course of centuries of attrition among crowds of gentle-men and gentle-women, known in ordinary conversation as "gentlemen and ladies."

Now clerks in stores are selected for their gentlemanly style of behavior; it is an essential qualification for a clerk that he should be polite and well behaved, and it is on account of their having tuese qualificatious that they are better received in society than mechanics. Let a mechanic however, qualify himself for society and study to make himself agreeable, as clerks are obliged to be, and he can have the entrée of as good society as the clerk, in fact, my experience is that the workingman or mechanic, has advantages in social intercourse above the mere clerk, because, as a general thing his mind is superior. The training his mind receives in learning a trade improves him in more ways than one, if he only aims for superiority.

A MECHANIC.

[Our correspondent falls into the error that there is a distinction generally made in favor of clerks over mechanics, in regard to their admittance into good society. We repeat that we know of no society in this country—beyond a select and exclusive class to which neither would be elligible under ordinary circumstances—that makes any such distinction.

We dissent from the opinion that the servile and puppyish manners acquired in the counter-jumper's profession are superior in any respect to the manly independence yet general courtesy of mechanics. We affirm that as a class mechanics are infinitely better informed, have better minds, better health, look better and feel better, live better, earn more money, and use it more wisely than clerks in dry goods and fancy goods stores. Of course we dont include every kind of clerks in our expressions of opinion, but we do believe, man was created for a nobler purpose than peddling dolls or attending milliners' shops.

Our correspondent has missed the entire drift of our article, if he failed to see that the difference which we alluded to was in favor of the bricklayer, as compared with the fancy goods clerk, in his manliness, his mental ability, and his courage, and that these qualifications, not his greater wages, were the true secret of his power when he "strikes" and the want of them the very reason why the fancy goods clerk, *is* a fancy goods clerk, and why he will always bow his neck to the yoke, and submit to the exactions of his employers.—EDS.

Center of Gravity.

MESSRS. EDITORS:—The difficulty with Mr. McCarroll, about the centers of gravity in revolving wheels, arises from the fact that he does not, or has not, considered the difference between gravity (which is an immutable principle) and centrifugal force, which is changeable—being a mechanical force and not a principle. Gravity has no motion, but is the same every instant of time; and, hence, a wheel cannot be put in such rapid motion as to change the center of gravity. If it could, then we could have perpetual motions. Gravity cannot be changed by mechanical force, hence nature will, in every case, find its own balance; and thus no such thing as a self-moving machine, or perpetual motion, can be brought into existence.

JOHN S. WILLIAMS.

Thermometers—How to Select.

MESSRS. EDITORS:—I have just purchased a thermometer, made by Sargent & Co., and, on comparing it with one of Kendall's thermometers, I find a uniform difference of two degrees between the two instruments. There must be an error somewhere; but where is it? It cannot be in the tubes, for the improbability of two tubes having the same imperfections—which must be the case, other things being equal—to give uniform results, amounts to almost a moral impossibility. It cannot be in the graduations, or in the scales, for the same reason. If there be an error in the graduation of one of the tubes, or one of the scales, there must be precisely the same error in the other tube or scale, to give a uniform difference of two degrees. It is possible that the discrepancy is due to such a combination of errors in the two instruments as exactly compensate for each other, and so give uniformity of action; but this is too improbable to merit a moment's attention. The fault must, then, be sought for in the adjustment of the tubes to the scales. By the aid of a microscope I find, upon the Kendall tube, certain scratches or file marks, evidently made by the graduator, corresponding to the figures on the scale—32, 60, 100, and 140.

On the Sargent tubes are similar marks, corresponding to figures 34, 62, and 92. As the file marks upon the former occur at the definite figures or landmarks—32 "Freezing point," 60 "Temperate," 100, and 140; while those upon the latter at 34, 62, and 92—I conclude that the Kendall tube is properly adjusted to the scale, and that the Sargent tube is raised two degrees too high—an error which cannot be corrected without taking the instrument apart, and enlarging the upper hole in the brass scale. If the above premises and deductions are well founded, the inference is that both the instruments are perfect in all their parts, with the single exception that one of them is imperfectly put together.

It is a notorious fact that hardly two cheap thermometers exactly agree at all temperatures; but by comparing one instrument with another, and noticing whether the difference in the hight of mercury, if any, is uniform, at different temperatures; whether the file marks, which can generally be found by sliding the point of a knife along the sides of the tube, occur at definite figures or landmarks, of which 32 will always be one, and whether a portion of the mercurial column, broken off by a slight jar, occupies equal or varying lengths in different parts of the tube, it is not difficult to ascertain where the error if any is, and whether it is remediable.

J. H. PARSONS.

Eating Clouds.

Dr. Livingston, relating his adventures on Lake Nyassa, thus tells one curiosity which he fell in with: During a portion of the year, the northern dwellers on the lake have a harvest which furnishes a singular kind of food. As we approached our limit in that direction, clouds, as of smoke arising from miles of burning grass, were observed bending in a southeasterly direction, and we thought that the unseen land in the opposite side was closing in, and that we were near the end of the lake. But next morning we sailed through one of the clouds in our own side, and discovered that it was neither smoke nor haze, but countless millions of minute midges called "kungo" (a cloud of fog). They filled the air to an immense hight, and swarm upon the water too light to sink in it. Eyes and mouth had to be closed while passing through this living cloud, they struck upon the face like fine drifting snow. Thousands lay in the boat after emerging from the clouds of midges. The people gathered these insects by night and boiled them into thick cakes, to be used as a relish—millions of midges in a cake. A kungo cake an inch thick, and as large as the blue bonnet of a Scotch plowman, was offered to us, it was very dark in color, and tasted not unlike caviare or salted locusts.

Presto Change.

The *Richmond News*, says a man in that city is manufacturing butter by a chemical process at the rate of one pound and nine ounces from one pint of milk and two eggs. It says: "We know that the statement seems improbable; we know that people will turn up their eyes incredulously, and say, 'it can't be done, it can't be good,' etc., but the proof of the pudding is in the eating. The operation is performed every morning at nine o'clock, and every evening before sales commence at Mr. Smith's auction room, in the presence of crowds; and doubters are invited to go and see the butter made, and see it weighed, and then to taste it before they pronounce the thing impossible. The butter can be made in any churn, crock, or jar."

We have not the least doubt of the truth of this statement. We have heard that a French cook will make plenty of good soup from pebbles, provided a sufficient allowance of other materials are incorporated. So in this case we see no reason to doubt that one pound and nine ounces of butter can be made from a pint of milk and two eggs, provided the chemical employed in the process be one pound and a little over eight ounces of butter.