ly, no other livers than those of the cod can be employed in the preparation of the oil.

As soon as the cod are known to have arrived, the fishing begins without delay. The total number of men assembled by the first of February is estimated at 25,000. The quantities of cod are prodigious, their numbers incalculable; a good or bad season does not depend on the variable supply of fish,—that is apparently always the same, and beyond computation,—but upon the weather, as every rough day prevents the open boats putting out to sea, and occasions a serious loss to the whole fishery.

Three different methods are employed in the capture or the cod; the deep line, the long line, and nets. Every afternoon, at a given signal from the surveillance, those fishermen having nets or long lines, row out one or two sea miles to their fishing grounds, set their tackle, then row back and pass the night on shore. Next morning, the signal being again given, they all row as before, take their catch, and return with it during the afternoon. The fishermen with deep lines remain all day at sea, leaving very early and returning in the evening. The distance these have to row is from four to seven English miles.

As soon as the fisherman has come to shore, he proceeds to cut the head off every fish and takes out the roe and liver, thus distributing his catch into four groups. The roe he usually salts immediately. The livers are disposed of in the following manner: some he throws at once into large wooden vessels, holding from eight to twelve hogsheads, and, by frequent agitation and stirring with wooden beaters, obtains from them, at the ordinary temperature, a fine transparent oil, which floats on the surface. This oil is drawn off and preserved separately. The livers thus partially exhausted are then either secured in barrels for the purpose of oil burning at home, or else, being left in the open wooden vessels, suffer decomposition; the oil produced becomes gradually darker, bubbles multiply, gaseous products are freely disengaged, accompanied with an exceedingly unpleasant, penetrating smell, that may be perceived at a great distance. The best livers and the finest oil are taken from those fish that have just arrived from the deep sea; the cod is then fattest, and in best condition; but by remaining in shallow water, where the function of spawning is accomplished, where feeding is not its object, and where little food is to be obtained, it becomes leaner and leaner, until, on its return to the deep sea, it is quite emaciated.

Cod fishing at Lofoden terminates on the 14th of April, according to ancient custom, even though the fishing may be productive, with a prospect of continuous good results. The reverence that the northern races have for the festival of Easter is the original cause for this usage, together with the ardent desire felt by every individual to pass the holidays following that religious anniversary, preceding as they do the joyful spring time and much longed for summer, in his own home.

On arriving at their several huts and villages, the preparation of the oil is proceeded with, and generally completed by the end of May. While the barrels of liver remain at Lofoden, and still more during the journey afterwards, much of the cellular tissues becomes disintegrated, and the oil flows out; so soon as the barrels are opened, the oil is carefully poured off and kept apart, and this, together with that made at Lofoden in the open wooden vessels, is the light yellow oil. The livers having been partially exhausted are then thrown into iron kettles hung over an open fire, the water contained by the livers being allowed to evaporate; the oil is poured off as fast as it becomes disengaged by the warmth, and is put into barrels. This is brown oil. Increased heat above 212 Fahr. is now applied; the color deepens; as the temperature increases, the oil gradually grows darker, till at last, when what remains of the livers floats about as hard dark lumps in oil that is almost black, the process is considered to be finished, and the remaining product is the dark tanner's oil.

In Sweden, Denmark, and even in Norway itself, as well as in other places, there is a prejudice in favor of the brown oil. It is regarded by many as superior in its remedial properties to the light yellow oil. But as the light yellow is an exudation at a low temperature from the liver at its freshest period, and has certainly less flavor and odor than any other kind, it does not appear that this preference is well founded.

Fully sensible of the great natural advantages possessed by the Lofoden Islands, Mr. Möller, of Christiania, has been for many years desirous of introducing into general use a superior method of preparing the oil. Manufactories following his suggestions are in operation at Lofoden, Söndmöre, Christiansund and Finmark. The process he recommends may be thus described: The livers are to be treated immediately on their arrival on shore, being less than one day old. The selected ones, all of large size, are washed for the purpose of removing blood, membrane, and all other impurities. They are then introduced into a machine which reduces them into a paste. The paste is then transferred to an apparatus heated externally by steam, and the mass cautiously warmed to 100° or 120° Fahr.; at the same time it is diligently stirred and pressed with large wooden spoons, so that the oil may be liberated at the lowest possible temperature consistent with economical results. As fast as the oil separates, it is withdrawn; and the stearine being first thrown down by exposure to a temperature under 40° Fahr., is filtered; after which it is considered perfect, and may be put forthwith into barrels and bottles. The fresher the liver, and the lower the temperature the clearer, lighter, and sweeter in taste will be the oil. Livers more than one day old require a higher degree of heat.

Three barrels of liver will yield one barrel of the finer oils, and a quarter of a barrel of dark oil; but these proportions are only approximative, for the results will always vary according to the temperature employed in the process. It is never originally brown, but is liable by lying long in wooden casks to acquire a little more color.

The annual produce of cod liver oil by the Lofoden fisheries is estimated at 25,000 barrels, each containing from 24 to 28 English gallons, and that of all the other fisheries on the coast of Norway at about 35,000 barrels more, making a total of 60,000 barrels. During the last two years prices have not been sufficiently remunerative to encourage the preparation of the fine oil on a large scale; only two manufacturers at Lofoden have done so, and one of these, according to the chief of the surveillance, made only ten barrels this year.

The information now incidentally given relating to the propagation of the cod, the deposit of its ova, and the security of the young fry is, though limited, an important addition to our knowledge of the natural habits of the fish; should further observations confirm the opinion held by practical men on the spot, then it will appear that Lofoden is the natural nursery for these immense shoals of cod that swarm the northern seas. Of course, cod ova may be deposited and hatched on many coasts, our own included, but nowhere on the same scale and with the same great results as at Lofodon.

Immense shoals of cod arriving from the deep sea make their annual appearance on the Norwegian coast early in January and continue there to the end of April. when the last of them return. At Newfoundland, shoals of cod arrive at the end of June and retire in October. By a comparison of these dates, it is apparent that their arrival first on one coast, then on the other, and their departure first from one coast, then from the other, are separated by exact intervals of six months. In both cases they come from and return to the deep sea, that is, the Atlantic Ocean. At Lofoden they arrive, and now alleged, for the purpose of spawning; at Newfoundland, certainly as fish of prey. At Lofoden, all other kinds of fish fly before them, and are suffered to escape; at Newfoundland, they follow in fierce pursuit shoals of capelin, cuttle fish, and herrings. At Lofoden, they arrive in their finest and best condition, leaving thin and emaciated; at Newfoundland, they arrive hungry and ravenous, devouring their prey with the greatest voracity, until at last they become gorged and no longer able to feed; in this state, previous to their departure, they can be seen through the clear water to refuse their favorite food held before them as bait. From the great bank of Newfoundland to Lofoden flows that powerful equalizer of temperatures, that warm river in the sea, the great Gulf Stream. In its course, and about midway between Lofoden and Newloundland, is the island of Iceland; cod leaving Lofoden in March to arrive at Newfoundland in June and July, might be expected between these dates to appear on the fishing grounds of this island; they actually do so, the chief cod fishery in Iceland occurring in the spring and summer. Finally, cod approach Lofoden from the southwest; Newfoundland is due southwest of Lofoden.

Weighing these facts, a very interesting and important inquiry presents itself, whether these multitudes of fish, retiring as they do from one and appearing on the opposite side of a great ocean at definite and exact intervals, may not be composed of the same individuals moving in prodigious numbers and probably in detached shoals, urged by a powerful instinct to pursue systematic and periodical migrations—to the East for the purpose of propagation, and to the West in pursuit of food.

SWEETS, AND THEIR MANUFACTURE.

The last thing a child inquires about is how the sugar plum it snaps up with such avidity, is made. Yet the manufacture of these delicacies—we had almost said necessaries—of the nursery is a thing worth witnessing. A marvellous change has come across the public opinion respecting sugar and sweets of all kinds. They used to be denounced by tender mothers as "trash and messes," and possibly because they were so denounced, they tasted all the sweeter to the little ones. Now there is no attempt to taboo that which delighteth the juvenile palate most. In moderation, there is nothing more wholesome than sugar; and it is, withal, nourishing and warming, in consequence of the large amount of carbon contained in it. Formerly lollypops were not a speciality; there were no large establishments for their production; they were, in fact, one of the miscellaneous items kept in bottles at the pastry cooks. All the higher-class sweets came from France and Italy, where for ages they have been famous for these delicacies. But the introduction of steam into their fabrication has given to England the lead in manufactured sugar articles, which are now made on the largest scale, and are vastly cheapened since the days when we used to spend our halfpence in toffy. The rude style of old is also gone. The eye must now be satisfied as well as the palate, even in the cheapest items. Think of a halfpennyworth of sweets done up in a ruby-colored gelatine packet. There was color, it is true, in some of the more showy sweets of old, but it was metallic color containing the most virulent poison. Doctor Hassall's analysis of this painted confectionery, published in the *Lancet* some years ago, exposed the villanous manner in which this vividly-colored sweetmeat was made attractive to the children by poisonous paint. The brighter the hue the more deadly the sweet. The brilliant green, for instance, with which the toy confectionery was adorned, contained arsenite of copper, as we shall presently show. One can quite understand the bad name sweets acquired when thus made up. There was vermilion in the reds, of course, and gamboge and chromate of lead in the yellows. No doubt many young children were absolutbly killed by plentifully partaking of these artistically poisoned comfits. The analysis of the *Lancet* has delivered us from this cause of infantile trouble. Nothing but harmless vegetable colors are now used, which if not so brilliant as metallic ones, are quite safe. The production of sugar plums on a manufacturing scale has caused swifter methods of fabrication. The small items, such as rings, scissors, shoes and hats, are cast in starch molds, and the delicate sweets containing some essences, such as pine apple essence and pear essence, are made in the same manner. It puzzles older heads than those of the children to know how this drop of delicious liquid gets into the center of the sweet. Like many other puzzling matters, it is very easily explained. The flavoring essence is mixed with the liquid sugar, and when poured into the mold the latter crystallizes immediately over the former. These essences, so nice to the taste, are the most remarkable examples of the power of chemistry to transform very repugnant materials into delicacies. Fusel oil is the base of the pear essence, and pine apple essence is obtained by diluting ether with alcohol. The chemist in his laboratory with great cunning manufactures scores of these essences, which are supposed to be the veritable product of delicate fruits. Some of the pretty forms that are made to take the fancy of the little ones are simply punched out of flat films of sugar rolled; some are cast, as we have before mentioned; some are pressed into shape, when soft, between engraved rollers. The drops and sweets that are quite clear are boiled so long that all the water has evaporated out of them. Such sweets must be immediately bottled up, or preserved from the air, otherwise they absorb water and become semi-liquid. Barley sugar is an example in point. If it is not hermetically sealed down in tins, it deliquesces, and loses all its crispness. It is as well to know that this is the purest of all sweets—being absolutely clarified sugar, and therefore the most wholesome for children. On the other hand, peppermint drops are the most open to sophistication. They should be made of crushed white sugar, mixed into a paste with gum. But the temptation to adulterate is too great for the dishonest trader to resist; consequently, in order to supply the cheap market, one half plaster of Paris is mixed with inferior sugar. One can quite understand the sickness that overtakes children sometimes after sucking these comfits; the wonder is that such a mass of plaster does not interfere more signally with their digestion. Jujubes, those flexible lozenges which stick so in the teeth, contain a large portion of gum. They are poured into tins to cool, stoved for several hours, sliced into sheets, and then cut by scissors into the well-known diamond shapes.

The veritable sugar plum, or almond drop, is made in a very interesting manner. A number of almonds, after being coated with a little gum to catch the white sugar, are thrown into a deep pan surrounded with steam. This pan revolves sideways at an angle of forty-five degrees. As it revolves the almonds, of course, tumble over one another, and while they are doing so, the workman pours over them from time to time liquid white sugar, allowing sufficient time to elapse between each supply for the sugar to harden upon the comfit. In this way it grows by the imposition of layer upon layer, until it is the proper size. By this simple motion, the sugar is deposited in the smoothest and most regular manner. Girls are largely employed in the sugar plum trade; they are quick, and stick well to their work; but they have a sweet tooth, and help themselves to the lozenges pretty liberally. As it is impossible to stop petty pilfering, they are given liberty to eat as much as they like, and the establishment we went over annually debited itself with a sum of two hundred pounds for the sweets consumed by the children. They certainly did not look any the worse for their unlimited consumption of lollypops, and gave a sufficient answer in their ruddy faces to the old charge against the deleterious nature of sugar plums.

The manufacture of the surprise nuts is done with the utmost speed by these little workwomen. The nut is first opened by means of a rose cutter; the kernel is then cleared out with a penknife, the hollow is filled with seedsweets, and the hole by which they have been introduced is sealed with chocolate. It is great fun, of course, when you have cracked a nut to find your mouth full of these small sugar seeds, whether you expected the surprise or not. In one part of the establishment we came upon the little artists coloring the small articles cast in sugar. It was all vegetable color, of course, and quite harmless. There is no great artistic talent required in the coloring operations they have to perform, and it is too cheaply paid to be very carefully done; but however poor they may be as works of art they are not unwholesome, which, as we have before said, was far from being the case a few years ago, before Doctor Hassall turned detective officer for the good of our little ones. Here, for instance, is the report of some mixed sugar ornaments, just such as we have described the children coloring:

"Purchased in Middle Row, Holborn. The confectionery in this parcel is made up into a variety of forms and devices, as hats, jugs, baskets, and dishes of fruits and vegetables. One of the hats is colored yellow with chromate of lead, and has a green hat band round it colored with arsenite of copper; a second hat is white, with a blue hatband, this pigment being Prussian blue. The baskets are colored yellow with chromate of lead. Into the coloring of the pears and peaches the usual non-metallic pigment enters, together with chromate of lead and middle Brunswick green. This is one of the worst of all the samples of colored sugar confectionery submitted to analysis, as it contains no less than four deadly poisons." That the fashionable West was guilty of selling sweets equally adulterated with those of the Drury Lane and Holborn shopkeepers, we give in proof one more analysis of a fish purchased in Shepherd's Market, May Fair: "The top of the nose and the gills of the fish are colored with the usual pink, while the back and sides are highly painted with that virulent poison, arsenite of copper." We might describe scores of specimens purchased in every quarter of the town

full of the like poisonous matter, but they are now things of the past. It is a misdemeanor to use metallic color in confectionery; it is just possible, however, that some of the old sweets may still remain unsold, so we bid parents beware of any sugar plums with vivid greens and reds, for they are sure to be poisonous.

Steam has helped us to undersell the French; now we export to that country much of the coarser kinds of sweets. In England we make for children, in France the "bonbon" is made for children of a larger growth. Nothing can exceed the taste with which the sweets are put before the public across the Channel. The boxes they are packed in are works of art in themselves. About Christmas time some of our leading West End shops are full of the artistic confectionery from the Parisian manufactories. It looks so pretty that we scarcely like to demolish it. It must be remembered that the presentation of caskets of sweets is a custom among the fashionables in France; our neighbors have, therefore, to meet the critical and fastidious taste of adults, and hence comfits, etc., rise in that country to works of art. We like sweets in this country, but we are too great cowards to own it; we do not doubt, however, that simpler tastes will prevail, and cause more artistic skill to be exhibited than is now thought necessary for our nurseries. If we expect a large export trade it should not be forgotten that other nations require even their sweets to be presented to them in a graceful form. In order to show the increase that has taken place in the trade, we may state that twelve years ago our entire make did not exceed eight thousand tuns, whereas in 1862 it had risen to twenty-five thousand tuns, and is now not very far short of thirty-five thousand tuns per annum. This amount does not include the rough sweets made in the hucksters' shops, nor the toffy made at home, which is not inconsiderable. If the whole nation should go back to the tastes of our childhood, like the French, the production would at once mount up to double the score at which it figures at present. That the English have a sweet tooth, witness our rich port wine, which is in itself a confection, such as no other nation but ourselves under the sun will drink. Such being the natural tendency of our palate, we do not doubt but that we shall take to sweets as naturally as the Italians do, albeit we have no carnival in which to use them as pleasant missiles.—*Every Saturday*.

ACROSS MT. CENIS—FELL'S MOUNTAIN RAILWAY.

"S. H. W." sends us the following supplementary account of his trip over Mt. Cenis:

"We left Turin on the 5 o'clock evening train for Susa, situated at the foot of the mountain, the trip occupying two hours. Upon reaching the station, we learned that the dilligences were not to leave until 2 o'clock in the morning; therefore, betaking ourselves to a small, dismal-looking inn, we obtained a comfortable dinner—anything eatable tasting good to a hungry man. We then bunked down for a quiet nap, but were aroused at 1 o'clock to prepare for a start.

"We found, at the station, a crowd of passengers, who had come up from Turin on the 11 o'clock train; and it was very evident that those who had not secured their places in advance, would have to take up 'with pot-luck.' Being fortunate, however, in this respect, we had only to amuse ourselves by waiting and watching the movement of things. Four immense dilligences were got ready, and, by the aid of a pair of stout horses on the wheel, and five pairs of mules attached to each vehicle, we began to ascend the mountain. The moon was shining full and clear, enabling us to obtain a good view of the scenery; and, after journeying for three hours, during which time we had made but nine miles, the passengers with their baggage were all unloaded, in order to take the dilligence sleighs, as we had reached the regions of snow.

"There were eight of these clumsy-looking vehicles, and to provide for their movement the teams were divided into sixes—one horse in the shafts, led by five mules following each other in line, and presenting a novel sight, as this long procession wound its way up the zig-zags of the mountain. We continued our slow journeyings in this manner for several hours, until we had gained the summit,—the night, owing to the brilliancy of the moon emerging almost imperceptibly into the cold gray of the morning.

"At this point, upon the summit, the mules were dispensed with, and two pairs of heavy horses were attached to each sleigh. The wind blew a sharp nor'wester, the snow came dancing down the mountains, and drifted itself in our way to such an extent that workmen were engaged in keeping the path open. The scene was bleak and cheerless in the extreme. We had been suddenly transferred from the genial sunshine of Italy, to a winter's day as cold and blustering as ever swept over the green hills of Vermont. Even the little mountain cataracts were glazed over by ribs of ice, with pendant icicles. Upon reaching the point where the road begins to descend, one horse only was needed on each sleigh; and right rapidly did he dash down the mountain, the old sleigh swinging around the sharp curves, as if hung upon a pivot. It was our first sleigh ride of the season; and though hungry and cold, we enjoyed it as rare sport, though I judge from home letters that it would have been no great rarity to you. By means of a break, to grip into the snow, which the driver managed with considerable engineering skill, the steep descents and sharp curves were made with comparative ease and safety.

"At the end of the snow region we were all again unloaded and repacked into dilligences, this time drawn by five horses, the leaders working three abreast. There were an army of conductors, drivers, and riders; but no noise, no unnecessary whipping, and no confusion, in making the many changes of vehicles and animals.

"In this way we journeyed to San Michel, the railway terminus on the French side, which point we reached at noon, having in the mean time once again changed horses. At San Michel we were met by the French custom-house officers, who extended to us a cordial reception. The passengers, by this time, were tolerably hungry, and did full justice to the provisions of the restaurant; 'so that the cats and dogs had reason to lament the polish of the bones.'

"An hour's time was just enough to go through the formalities of the occasion, and at one o'clock in the afternoon, we were off again, but this time in a comfortable railway carriage, expecting to stop for the night at a place called Culoz, at the junction of the roads to Lyons, Paris, and Geneva. Upon getting out of the train, however, we found out just in time that there was no hotel short of a carriage ride of three miles to the village, therefore we took the next train for Lyons, where we arrived at half-past ten in the evening. The trip from Turin to Lyons, altogether, combined more of novelty than anything we had before experienced.

"Fell's over-mountain railway, which has already been described in the SCIENTIFIC AMERICAN, follows the windings of the dilligence road all the way from Susa to San Michel, and is a bold curious piece of engineering. The work upon it was suspended during the winter months, but the superintendent expected to have the cars running some time in May.

"Over the higher portions of the mountains, and for several miles along where the snows are most troublesome, the road is being covered in by heavy masonry supporting a corrugated iron roof. Somebody has had faith enough in the success of this enterprise, to spend a vast deal of money upon it; and with a good deal of care bestowed upon the track and machinery, I do not see any reason why it may not be a safe, and, certainly, a much more rapid and comfortable mode of crossing Mt. Cenis than by dilligence.

"Lyons, next to Paris, is the largest city in France. It is, moreover, an exceedingly fine place, built in an excellent situation. The inhabitants live by the manufacture of dress silks, ribbons, and velvets. There are no large factories, but the work is chiefly carried on at the homes of the weavers. Jacquard looms are to be seen through almost every window, as one passes through the quarter occupied by the weavers, and a fine monument to the great inventor has been erected in one of the public places. At the present time weaving is very dull, and the operators are suffering considerably.

"The distance from Lyons to Paris is 319 miles; the express train runs through in ten hours, including fourteen stoppages. The railway is a model of good management."

Correspondence.

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

Correspondence of the Sun with the Clocks.

MESSRS. EDITORS:—One of your correspondents asks, page 197 of this volume, "Why is the sun's center on the meridian ever back of the clock?" and you answer: "Because of the elliptical orbit of the earth, and the inclination of the earth's axis on the ecliptic." Allow me to remark that the sun's center is *not* always back of the clock, but half the time ahead of it, and that the inclination of the earth's axis has nothing to do with this phenomenon, which constitutes the difference between the mean time and solar time. The explanation is this:

On a well regulated clock, the days of twenty-four hours have of course exactly the same length; but the solar days, when measured by the time that the sun daily reaches the meridian, have not the same length; this is not caused by any irregularity in the daily rotation of the earth around its axis, as this rotation is perfectly regular, and proved by the most acute astronomical observations not to vary the least fraction of a second during several centuries (at least, at the present stage of the earth's existence); but it is caused by the fact that the earth, during its yearly revolution, does not remain at the same distance from the sun, its orbit being an ellipse, as you remarked in the answer above: the earth thus moving sideward in relation to the sun, and at the same time alternately approaching or receding, accelerating and retarding in its yearly orbit, causes an irregularity in the apparent place of the sun at the time of its crossing the meridian, or, in other words, the apparent daily motion of the sun is sometimes accelerated and sometimes retarded, and therefore the center of the sun passes the meridian sometimes before noon and sometimes after, when this time of noon is taken by a well regulated clock.

Tables have been calculated, founded on observation, how much these differences are for each day of different years, to within a fraction of a second, and such tables, with many others, are published several years in advance, by the Government at Washington, for the use of navigators, under the title of *American Ephemeris*. I extract from the *Ephemeris* for 1869 the following facts:

On Jan. 1, 1869, the sun will be behind the well regulated clocks nearly 4 minutes; March 1, nearly 12½ minutes; April 15, the sun will be nearly equal with the clock; May 15, the sun will be ahead nearly 4 minutes; June 15, the sun will be nearly equal with the clock; July 26, the sun will be behind nearly 6½ minutes; Sept. 1, the sun will be nearly equal with the clock; Nov. 2, the sun will be ahead nearly 16¼ minutes; Dec. 24, the sun will be nearly equal with the clock.

It will be seen that the sun is four times a year equ with those well regulated clocks, which indicate the mean or average time, namely, April 15, June 15, Sept. 1, and Dec. 24; the sun is twice a year ahead of the clocks, namely, from middle of April to middle of June, and during the months of September, October, November and December; for the rest of the year the sun will be back of the clocks, and this change is taking place very gradually from day to day; the maximum days are given above.

Those dates and times shift slightly for other years, but to so small an extent as to be of importance only for navigators and astronomers, the same as the seconds and fractions of seconds given in the government tables, which I neglected in the above extract, for obvious reasons.

P. H. VANDER WEYDE, M. D.

Steam Temperature and Expansion.

MESSRS. EDITORS:—The expansion of saturated steam depends upon the temperature, and its pressure is about in proportion to its density. The expansion of a given pressure is easily found by formulæ patent to those who pretend to any theoretical knowledge upon the subject. Saturated steam does not exactly expand in accordance with the Mariotte-Gay-Lusac law, nor does any vapor, or even atmosphere, follow correctly the aforesaid law; in fact, the engineering world has to make the calculation by formulæ based upon practical results, obtained experimentally. The expansion of steam cannot be found correctly for any given pressure or temperature by the use of one formula. The existence of over forty-five different formulæ prove that we know as much about the expansion of steam as we know of the square of a circle; furthermore, steam (superheated steam) can exist at all temperatures, even below zero; if such was not the fact there would be no water in liquid form on the globe; it would have been long before this time, changed into solid ice at the polar regions.

It requires but a few words in order to show the error of Mr. Sisson's ideas regarding his own theory on expansion of steam. (See page 52, current volume.)

It is a well known fact to almost every apprentice in a machine shop, that steam engines cutting off steam, at usual pressure, at one fourth stroke, or below, still exhaust steam at a temperature above 212° of heat; if Mr. S.'s assertion be true, it would prove all steam engines cutting off steam at one half stroke, or below, a nuisance, they could not exhaust anything but water at a temperature far below the boiling point. Did this fact ever occur to Mr. S.?

Mr. S. also affirms that steam at seventy-five pound pressure cannot expand to twice its bulk without going below 212° of heat. I would advise Mr. S., in order to convince himself of the utter fallacy of his ideas upon steam expansion, to place his hand into the exhaust pipe of an engine that is working steam at seventy-five pounds pressure, at one fourth stroke, and I affirm that he will find nothing left of his theory but a burned hand.

Mr. S. speaks of expanding temperature to double its bulk, etc. Does Mr. S. measure heat by the bushel, or by weight?

Buffalo, N. Y. H. W. D.

House Fly Parasite.

MESSRS. EDITORS:—One afternoon, during the summer of 1866, a common house fly attracted my attention, from being thickly bespread with what seemed to be a red powder. After capture I detached some of the colored matter and placed it under the microscope, when it was immediately resolved into well developed insect life, apparently of the "tick" family, and of a cochineal color; repeated observation and experiment gave like result, then, and in the summer of 1867.

Having never seen an account of similar experience, nor met with any who have, perhaps your extended observation and acquaintance might throw some light on the matter, as to whether the occurrence is general, or confined to locality; or whether the fact has any bearing on the transmission of diseases among humanity. The latter idea may appear far-fetched, but it will be recollected that flies were at one time a plague to the Egyptians; probably from quantity, but possibly from some other cause. Judging roughly, it would seem a fair estimate to say, that did human parasites bear the same proportion to man, as those spoken of to the fly, we should have fleas and other "outside passengers" of about one fourth pound each in weight. ENTERPRISE.

Cincinnati, O.

Potassium and Sodium in Manures.

MESSRS. EDITORS:—On page 217, present volume of your paper, I notice an article stating that M. Eugene Peligot disapproved of the use of potassium and sodium as fertilizers, because by experiment he could find no traces of their presence in vegetables grown on soil where they had been used. Now, I used a quantity of compound sodium, that is, in the form of carbonate of natron, on my farm, and thereby made five spears of grass to grow where one grew before, and twice as stout. Yet, by analyzing the vegetable, I would not, perhaps, find a particle of sodium, while it was the very element of its growth. I pretend to say that potassium, or sodium, especially when combined with carbonic acid, is of the greatest benefit to vegetables. They undergo chemical combinations with the soil, thereby setting other substances free which nourish the plants. E. C. HASERICK.

Lake Village, N. H.

Self-adjusting Telegraph Magnets.

MESSRS. EDITORS:—Your correspondent, "S." (page 178), in asserting that a self-adjusting magnet is an impossibility, evidently refers only to the case of lines worked with two terminal main batteries and a "closed circuit," as is the usual custom in this country. If the transmitting station *only* uses a battery, it is evident that the key will break the *whole* of the electric current in all cases. This is known as the "open circuit" arrangement, and was formerly employed on the Bain lines in this country, and is at the present time much used in Europe.

The vital principle of Duxbury and Roberts' system referred