Correspondence.

Photographing the Vocal Organs.

To the Editor of the Scientific American:

I notice in your last issue an article on "Photographing the Larynx," in which you give the credit of having successfully photographed the vocal organs to certain scientists in England. A year ago last May, Dr. T. R. French, of Brooklyn, presented to the American Laryngological Society, at Boston, several views of the larynx, taken in Brooklyn a few days previous to the meeting and taken with ordinary sunlight. On (or about) May 23 last, he read a paper on the subject before the same society at their meeting in New York. and presented numerous pictures of the vocal organs in health while producing sounds, as well as several views of diseased states of the larynx, tumors, etc., all of which were taken with a small apparatus held in the hand, a mere attachment to the usual laryngoscopic mirror.

Besides this he presented several pictures of the post nasal passages, the photographing of which has never been attempted before. The medical journals of about that date gave a full report of the matter. I call your attention to these facts, with the thought that perhaps you might wish to accord to American experimentalists the credit that is due them.

GEO. B. BRAINERD.

23 Lafayette Avenue, Brooklyn, N. Y.

The Remarkable Shark.

To the Editor of the Scientific American:

The communication of Mr. W. Morey on the capture of "A Remarkable Shark" (*Rhinodon typicus*) off Ceylon is of interest, and is the first notice of its discovery there that has come to my knowledge.

The occurrence of the species in the Singhalese waters is not, however, very wonderful, for the sharks have so wide a distribution, and are such great rovers, that they may turn up on the most distant coasts.

It has, indeed, been remarked by Dr. Günther, an English ichthyologist, that the rhinodon "does not appear to be rare in the western parts of the Indian Ocean, and possibly also occurs in the Pacific." It grows to a larger size even than Mr. Morey supposed, and, according to Günther, "is known to exceed a length of 50 feet, but is stated to attain that of 70 feet." Mr. Morey is mistaken in supposing that it is "destitute of teeth;" it has, in fact, extremely small but numerous teeth of a subconic form, and in many rows. The rhinodon in the smallness of the teeth agrees with the great basking shark (*Cetorhinus*, or *Selache, maximus*), but is distinguished by many characters from that animal, and has been set apart as the type of a peculiar family called Rhinodontidæ.

It may interest your readers to learn that the *Rhinodon* has a representative in American waters. The species referred to is a very large shark that has been found in the Gulf of California, and indicated under the name *Micristodus punctatus*. The name implies that it has exceedingly small teeth and is spotted. The teeth are peculiar in form, and have a heel like base projecting forward and points directed backward.

The list of sharks given by Mr. Morey as inhabitants of Ceylon is not correct.

THEO. GILL.

Smithsonian Inst., Washington, D. C., July 13, 1883.

Alloys.

A mass formed by the mixture of any two or more metallic bodies, in which the different constituent parts cannot be distinguished from each other by their external characters, is an alloy. In this definition no distinction is made between mere intimate mechanical mixtures and proper chemical compounds, because we are hardly possessed of sufficiently accurate experiments to ascertain which belong to the former and which to the latter class. The mixed metals into which mercury enters are called amalgams, and they possess many curious and peculiar properties; in their general characters, however, they resemble the other metallic compounds, and therefore the observations in this article are equally applicable to each.

Almost every metal that is met with in commerce contains a small variable proportion of some other metal, and therefore, strictly speaking, they are all alloys. Thus, lead contains silver; tin, arsenic; copper, iron; but after the usual processes of refining are gone through, the quantity which each metal holds of any other metal is so small that its properties are not perceptibly altered by such admixture. A metallic mass, therefore, is scarcely considered as an alloy except the characters of the prevalent metal are obviously modified; in the same manner as the oil of vitriol of the stores acts the part and bears the name of sulphuric acid, notwithstanding a minute portion of potash with which it is combined.

Alloys are prepared either by melting the ingredients separately and pouring them together when they are liquid, or by fusing them all down together in the same crucible. When the metals employed are of different degrees of fusibility, and especially when the one that is the easiest fusible is also very inflammable, the first method is had recourse to; as when copper and tin are to be combined; but the latter is practiced in those cases where the materials are either nearly of the same degree of fusibility, or at least where the temperature required for melting the least fusible is not enough to volatilize that which is the most so. In order to prevent oxidation, the crucible ought to be lined with charcoal, and a quantity of decrepitated salt should be strewed over the top of the ingredients, which, melting at a very low heat, will float on the surface of the metal, and thus exclude contact with the air. By taking these precautions a lower and longer continued heat may be advantageously substituted for a shorter and more violent one, the ingredients will be mingled more perfectly, and the loss and consequent inaccuracy when experimenting on the most inflammable metals will in a great measure be avoided. As soon as the mass is liquefied, it will be of advantage to stir it repeatedly, to prevent the ingredients from separating according to their respective specific gravities, before they have had an opportunity of combining together; for this purpose a charred stick, or rod of baked clay, is to be preferred to one of iron, as this last would in many cases be acted upon by the melted metal, and spoil the process. The alloy should also be poured alternately from one red hot crucible into another, and back again, to insure intimate mixture of the ingredients. These are by no means useless precautions, for where one of the metals is of considerably greater density than the other, it requires particular care to make the quality of the alloy equal throughout the whole of the mass. Schlutter relates that twenty pounds weight of silver, containing about a fifty-sixth part of gold, was melted in a crucible, and poured into cold water to be granulated. Samples from the top, middle, and bottom of the mass were then assayed, and were found all to differ in their proportions of gold. In like manner, Mr. Hatchett observed that gold made standard, with the usual precautions, by silver, copper, lead, antimony, etc., and then cast into vertical bars, was by no means distributed equally, but that the top of each bar (being composed of the portion of alloy which occupied the bottom of the crucible) was both purer and of greater specific gravity than the lower end of the bar.

It is a matter of considerable importance to ascertain whether alloys are mere mixtures or proper chemical compounds. In most instances there seems to be little or no doubt of the latter being the case, and perhaps all the supposed examples of the contrary may be looked upon as instances of the supersaturation of one of the ingredients by the other.

The evidence of chemical affinity between metallic substances is of the same kind as in other cases, consisting either in an entire change of properties, or in such modifications of them as are obviously not intermediate between those of the constituent parts.

The remarkable difference between the fusibility of some alloys and that of their constituent ingredients may be considered as a sign of real affinity. As far as experiments have been instituted on this subject, it appears that the point of liquefaction in almost all alloys is lower than would have been inferred from the mean fusibility of their elements. Thus, a mixture of gold and iron will melt at nearly the same temperature that is required for the fusion of gold alone. In some cases the fusibility of the alloy is even greater than that of its most fusible ingredients; thus, an alloy of tin, lead, and bismuth will become fluid in boiling water; a heat not sufficient for the melting even of bismuth, the most fusible of the three.

Some metals appear capable of uniting with each other in any proportions, as gold and copper, lead and tin, lead and silver, etc.; others are said to combine only to saturation, as silver and iron, lead and iron, etc.; of this, however, there seems to be some doubt; while a few have been reckoned absolutely incapable of combination; thus, quicksilver is supposed not to unite either with iron, cobalt, or nickel. Something, however, in these three instances is to be attributed to the hardness of the metals, and to their requiring for their fusion, or even softening, a heat much greater, that will entirely volatilize quicksilver, so that the circumstances most favorable to combination cannot in these cases be brought about. This much, however, is certain, that if iron be previously combined with tin or zinc, the mixture will dissolve in mercury without difficulty, forming in the first instance a magnetic, and in the latter an unmagnetic triple alloy.

The durability of alloys is in most cases much less than might be supposed from that of their compounds; so generally indeed does this happen, that Macquer and Gellert are inclined to deny to those metallic mixtures that are ductile the name of alloys. This, however, is clearly carrying the matter to an excess. Some very ductile materials are rendered perfectly brittle by the addition of a very minute proportion of even another ductile metal, as is strikingly the case with the alloy of lead and gold, half a grain of the former rendering an ounce of the latter extremely spongy and brittle. In many of the brittle alloys, however, a variation in the proportion of the ingredients will so greatly modify this quality, without materially affecting the others, as to render it probable that brittleness is rather a proof of supersaturation than of chemical union. Iron, when combined with about a fifth of tin, forms a white alloy, whose fusibility, specific gravity, etc., clearly demonstrate a chemical union, yet the compound is very soft and ductile; but when the proportion of tin is rendered equal with that of iron, the mass is perfectly brittle. So in like manner copper with one-sixteenth of tin forms a malleable alloy, but if the tin is increased to one-third of the whole, the alloy is brittle. Even brass, which, when made of eleven parts of copper to one of zinc, is more malleable than copper itself, becomes brittle when zinc forms one-third of the mass.

In a few cases the color of an alloy may be considered as indicative of chemical union, being by no means intermediate between that of its elements. Of this kind is the golden color of the alloy of copper and zinc, and the silver hue of arsenicated copper; but the general similarity of color between the white metals and their alloys confines the application of this external character to a very few instances.—*Glassware Reporter.*

A New Kind of Gunpowder.

Himly, in his efforts to discover a new kind of gunpowder that should possess more power than the ordinary powder, without the dangerous properties of the nitro-compounds like dynamite and that class, found that the best results were obtained with a mixture of saltpeter, chlorate of potash, and a solid hydrocarbon.

The new powder is made by mixing finely pulverized saltpeter, chlorate of potash, and coal tar pitch with enough benzol (from coal tar) to make a plastic paste or dough. This is formed into flat cakes by pressing it into moulds, and the benzol allowed to evaporate. The cakes are then granulated like any other gunpowder. Like ordinary powder, the grains are irregular and can be made of any desired size. Its specific gravity is 0·9, or a little more, agreeing with common gunpowder.

It is quite hard, and does not smut off even when damp. It will bear a heat greater than that of melting tin without change. It will not ignite by a single spark of short duration. If ignited in an open vessel, it burns rapidly with a white light. In a closed space it burns violently, and leaves behind a slight residue, producing but little smoke. A gun is not injured in the least by the products of its combustion.

The advantages of this powder over those previously in use are essentially the following

1. Ease and rapidity of manufacture.
2. There is no danger in making it.
3. Its freedom from any hygroscopic qualities; 100 grammes of it exposed to damp weather for four days in an open window showed no gain of weight with a delicate balance.
4. It is two and a half times more powerful than common powder.
5. The slight residue, leaving scarcely anything.
6. The fact that it gives off so little smoke as to be scarcely noticed, and what is formed is totally innocuous as contrasted with that from nitro-explosives.—*Repert. Analyt. Chemie.*

Improved Photo Developer.

Where the photographer intends to travel, and develop on the route, it is very desirable to reduce his chemical outfit to the smallest bulk and to the fewest liquids possible. Mr. G. Cramer, the dry plate manufacturer, gives the following formula for a developer, which he considers gives the best of results, and at the same time has the advantage of extreme portability:

Stock Solution.

Sulphite of soda (crystals)	3 ounces.
Bromide of ammonium	½ ounce.
Bromide of potassium	1½ ounces.
Pyrogallic acid	2 ounces.
Dissolve in distilled water	32 ounces.
Add sulphuric acid (c. p.)	120 minims
Add aqua ammonia (strongest)	3 ounces.
Add water to make up bulk to	40 ounces.

The sulphuric acid and aqua ammonia should be measured very exactly. Instead of three ounces of crystals, two ounces of granular sulphite of soda may be substituted to produce the same effect. Dilute a sufficient quantity for one day's use as follows: for ordinary purposes, one part in eleven; for very short exposures, one part in three to six; for over-exposed plates, or in all cases where great intensity and contrast are desirable, one part in twenty. This developer may be used repeatedly if it is always returned immediately to the pouring bottle, which should be provided with a tight fitting rubber stopper. As long as the solution remains transparent, it is good; but when it looks muddy its use should be discontinued.—*Philad. Phot.*

The Effects of Thin Atmosphere.

Virginia City, Nevada, is a little more than 7,000 feet above sea level, yet even at that comparatively moderate altitude as compared with some other inhabited elevations the housewife finds some difficulty in cooking by boiling, the water boiling at too low a temperature to thoroughly cook meat and vegetables. The *Virginia City Enterprise* says that there is complaint every year that the peas brought from California are as hard as buckshot. The trouble is that the water does not become sufficiently hot to cook them. Here, when either meat or vegetables are being cooked by boiling, the vessel used should have a close fitting lid, in order that the steam may be confined. There is, of course, no trouble about roasting meats or anything else, fire being as hot here as in any other part of the world. While strangers complain much of the thinness of our atmosphere, old settlers are not much distressed, and children born and reared here seem not to suffer inconvenience in any way. They race up and down the sides of the mountains at full speed without finding any difficulty in breathing.

A Peculiar Worm Disease.

At a recent meeting of the Chicago Amateur Photographic Society, Prof. Bellfield showed a series of photo-micrographs, one of which, he said, represented a peculiarly interesting animalcule. It was a species of worm found in the blood—a new disease, and, so far as known, confined to the tropics, so that, as skillful medical practitioners are not very plentiful in those regions, the opportunities for studying it have been very limited. The particular case from which this photo-micrograph was made was an English soldier who had been some time in India. At the age of 25 he was sent home with his regiment, and quartered in London. Soon after arrival there he showed such peculiar symptoms that he was sent to hospital, where the speaker was then practicing. The picture before you represents a drop of blood obtained by pricking his finger. You will see it contains a great number of minute worms. The most remarkable part of the whole matter is, that these worms are present, or at least visible, only at night, from 5 or 6 P.M. to 8 or 9 A.M. They gradually increased in number from 6 P.M. to midnight, and then diminished to 8 A.M., by which time they had completely disappeared. The maximum number (about midnight) would be from 100 to 125 in a drop of blood such as could conveniently be included under the cover glass. It was very difficult to count them on account of their continual squirming, but by different persons counting, so as to check one another, we were sure there were over 100. We had this patient under our observation for about three months, and made a chart showing the variations in number of these parasites from hour to hour and from day to day. We also made a calculation of the total number probably contained in his blood at the maximum, and estimated it at about forty millions. Now, the question is, when they disappear what becomes of them? No satisfactory answer has yet been given to that question. One theory is that they are dissolved in the blood, and as they are of a very low grade or organism, there would seem to be some foundation for that theory, but it is open to the almost insuperable obstacle that no mother worm, however industrious, could possibly produce forty millions a day, and keep it up for three months or more. He might mention here that the parent worm has only been found in two cases. It inhabits the same body in which the larvæ are found, is nearly three inches long, and about the size of a hair. The disease is of such recent origin, and, as previously mentioned, confined to tropical countries, that opportunities for study have been very limited. It was first noticed in India in 1869. The likeness of this parasite to the trichina has been generally noticed—each has a distinct sheath, and each is capable of violent motion. It is, however, smaller than the latter, and is found only in the blood, while the former inhabits the muscles. It has been ascertained that the larvæ of these blood worms are sucked up by mosquitoes, develop in the body of the latter, and after the mosquito's death presumably arrive at maturity in the water, and are imbibed by human or other animals in drinking the water.

A Useful Kind of Solder.

A soft alloy which attaches itself so firmly to the surface of metals, glass, and porcelain that it can be employed to solder articles that will not bear a very high temperature can be made as follows:

Copper dust obtained by precipitation from a solution of the sulphate by means of zinc is put in a cast iron or porcelain lined mortar and mixed with strong sulphuric acid, specific gravity 1·85. From 20 to 30 or 36 parts of the copper are taken, according to the hardness desired. To the cake formed of acid and copper there is added, under constant stirring, 70 parts of mercury. When well mixed, the amalgam is carefully rinsed with warm water to remove all the acid, and then set aside to cool. In ten or twelve hours it is hard enough to scratch tin. If it is to be used now, it must be heated so hot that when worked over and brayed in an iron mortar it becomes as soft as wax. In this ductile form it can be spread out on any surface, to which it adheres when it gets cold and hard.—*Amateur Mechanics.*

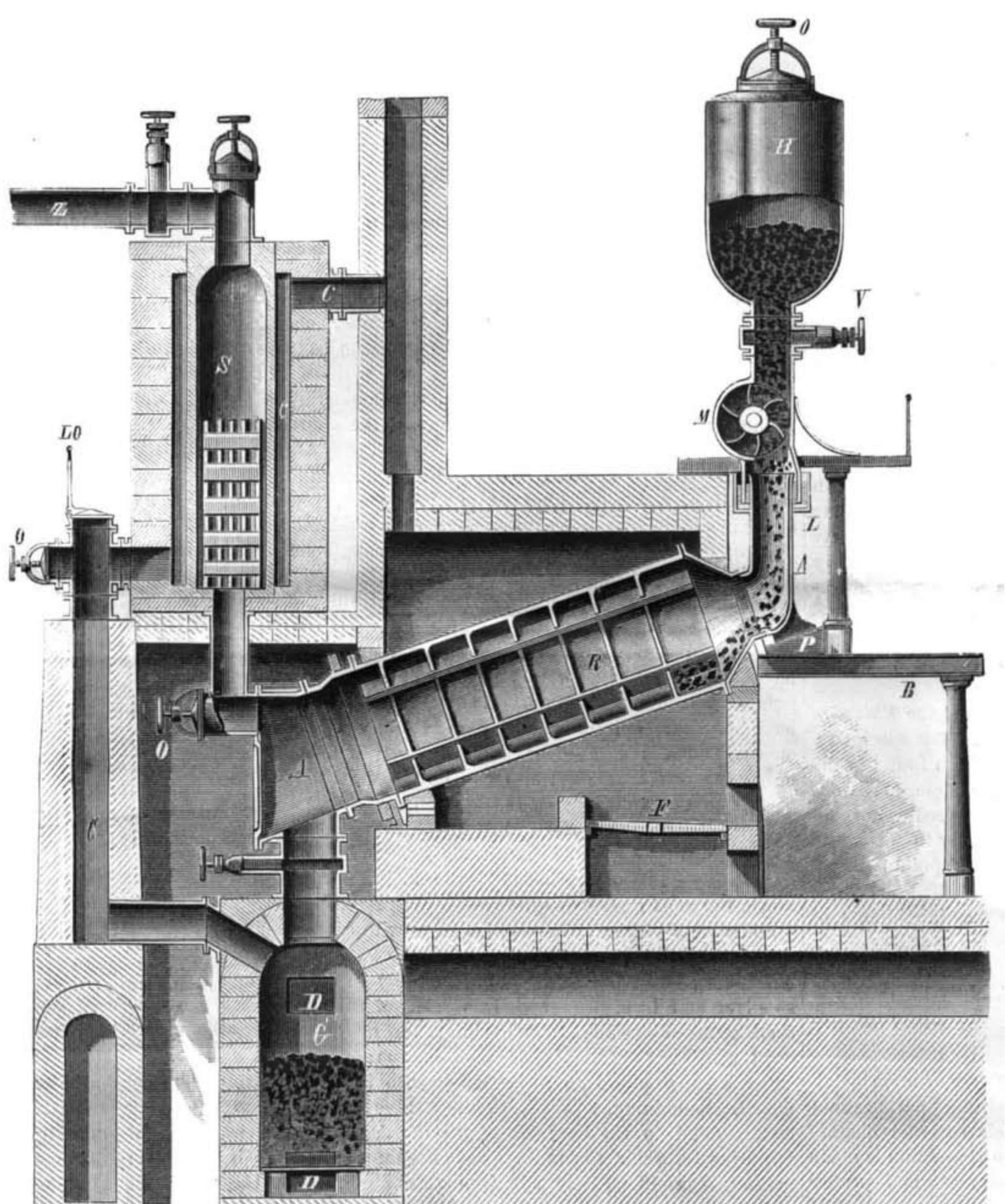
IMPROVEMENT IN THE MANUFACTURE OF ILLUMINATING GAS.

Coal gas is commonly made by placing from two to four hundred pounds of bituminous, or, as it is better known, gas coal into an iron or fire clay retort heated externally. The air being excluded from the retort, the coal is coked, the gas, tar, and other products of the coal being conducted away through suitable purifying vessels, and the coke remaining in the retort being removed at regular periods ranging from three to six hours, when the retort is again freshly charged with coal. The work of discharging and recharging the retorts is done mostly by hand labor, and from the fact that the temperature of the retort house when this work is done often reaches 116° to 120°, it may be inferred that this work is extremely trying to men, even after being long used to it. To make water gas, anthracite coal contained in a suitable apparatus is heated by external fire, but more frequently brought to incandescence by direct combustion. The supply of air is then shut off, and the vessel being closed by a valve, steam is admitted. The steam passing through the heated coal is decomposed principally into hydrogen and carbonic oxide. In a further stage this otherwise non-luminous gas is enriched by hydrocarbon vapors or gas to any required degree, and passing on through the purifying apparatus, the gas is disposed of the same as gas made from coal only.

In the accompanying engraving we illustrate in section a system for the manufacture of illuminating gas, devised by Mr. Frederic Egner, Engineer to the People's Gas Light and Coke Co., of Chicago, Ill., which seems to have novel and interesting features. By the use of this, the manufacture of coal and water gas may be united; cannel or ordinary gas coal being the principal material used, and this with the least amount of manual labor, the work being done for the most part by machinery, the action of the gases themselves, and the gravity of the material.

H is a hopper for coal, closed air tight at the top by the removable door, O. Several of this kind of doors are placed in desirable positions about the apparatus. V are valves to be used as occasion may require. R is a cast-iron retort, cylindrical in form, divided internally into a number of compartments by annular lips or flanges and longitudinal ribs or partition pieces. The retort rests at both ends on half pillow blocks, and is closed at the ends and still further supported by one stationary and one movable mouthpiece. The movable mouthpiece, A, at the upper end rests on the inclined slide, P, thus allowing expansion of the retort. Between the hopper, H, and movable mouthpiece, A, the joint is effected by the water lute, L; P and H being supported independently by beams, B, and suitable pillars. G is a water gas generator or the coke chamber, provided with doors, DD, and a blast pipe at X, and steam connections. C are hot air chambers or flues for the passage of the gases of combustion. S is the superheater or fixer for the gas. Z is the pipe through which the good gas passes to the purifying apparatus.

The process of gas making by this system is as follows: The hopper being filled with coal, the air tight cover closed, and the retort brought to a dull red heat, say about 980°, near which it is to be kept throughout the process, the retort is caused to be slowly revolved by means of a cog wheel keyed upon the lower end of the same, which is engaged by a pinion upon a shaft, not shown in the cut, which imparts motion to the whole. As the retort slowly turns over the fire on the grate, F, the coal will drop from the upper chamber into the next below, and so on, until the coal, deprived of the richest and largest part of the gas, drops into the coke chamber. As the upper chamber of the retort is emptied, the measuring drum, M, delivers a fresh charge of coal from the hopper into the retort. At the temperature mentioned, the results of a ton of coal would be about 6,000 cubic feet of rich gas, and a large amount of tar and other vapors. These vapors in the ordinary processes are, almost immediately after leaving the retort, condensed in the hydraulic main, where they must pass through a lute composed of tar and water in escaping from the retort. But in this process the tar still in the shape of vapor—to which condition it cannot be brought again by ordinary means after being once condensed—is brought into the superheater, S, a retort heated externally and filled with loose brick laid in a checker form as shown, and then the tar vapors are for the most part converted into rich gas. And in this way alone it is believed that the product of gas per ton of coal would exceed any results previously worked by the old processes. The gas, too, will be exceedingly rich.



NEW APPARATUS FOR THE MANUFACTURE OF ILLUMINATING GAS.

The coke while still in a red hot state, is treated with a current of superheated steam, and until quenched will decompose the steam, and thus not only considerably swell the volume of gas made, but this volume being non-luminous, it will in a simple and economical manner reduce or dilute the otherwise too rich gas made in the first operation. The quenched coke may then be removed. But if it is not desired to save the coke, the process for making water gas in addition to coal gas, and in combination with the same—aided with a little oil—can be fully carried out, and all the coal placed in the retort be thus converted into gas, excepting naturally that part of the coal—the slag or clinker—which must be removed the usual way through the lower door of the generator, G.

It has been found in practice that iron retorts, when not heated above the temperature herein stated, have, after fifteen months' use, been practically as good as new. Fire clay retorts have been substituted for iron, because by enabling the coal to be subjected to a greater heat a larger yield per ton was obtained. But here we convert the gaseous products of the coal into fixed gas and condensable vapors in the iron retort without injury to the latter, and then send these products into a fire clay retort heated to any required degree, and then complete the operation. By comparing this with older processes, it must be admitted that the system is worth a fair trial at least.

Further particulars may be obtained by applying to the inventor, Frederic Egner, care of People's Gas Light and Coke Company, 39 and 41 So. Halsted St., Chicago, Ill.

DR. H. WINNACKER (*Naturforscher*) has made a particular study of the vegetation of sewers and of drainage channels. He finds that the algæ which are harmless flourish best in channels which are constantly traversed by clean water. On the other hand, the Schizomycetes (including *Micrococcus, Bacillus, Spirillum,* and *Bacterium*) which are dangerous flourish in water courses which are alternately wet and dry. A green deposit is a favorable sign.