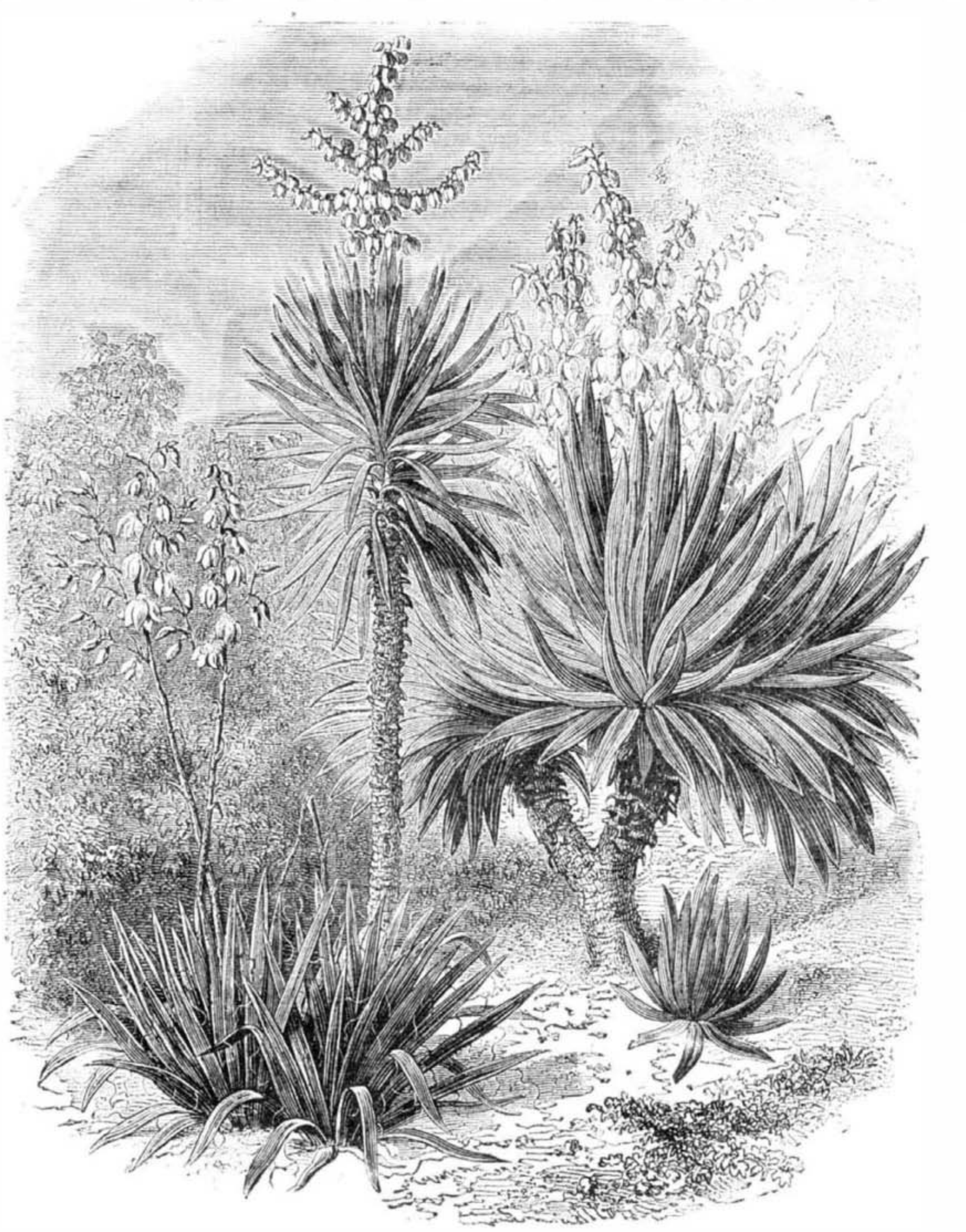
THE YUCCAS.

Much might be written, and that to good purpose, on the stately effects to be obtained by the judicious planting of yuccas of different kinds in garden scenery. It is impossible to overlook their beauty, even when planted singly or in formal lines; but if arranged in bold groups and masses, they are unsurpassed as flowering and foliage plants for outdoor decoration. Their great panicles of pearly white, bell-shaped blossoms contrast so well with bright green conifers and low-growing shrubs of less distinct contour that all through the summer and autumn it is possible to form charming pictures by massing them either on the margins of shrubberies or in sheltered nooks on the lawn and pleasure grounds. These plants are simply invaluable if properly used in forming picturesque groups and clumps, instead of being, as is too often the case, dotted indiscriminately here and there on turf in unmeaning regularity. It has often been said that the hollyhock is the only decorative flowering plant of any importance to the landscape gardener. But the yuccas are even more stately, however; and they are permanent in character, being quite as ornamental in winter as in summer. They succeed nearly equally well in any soil, but a deep, rich, well drained loam is preferable; and they make finer specimens, if sheltered from rough, cold winds, than they would do if more exposed. The flowers of all the species (and these are more numerous than many imagine) closely resemble each other, being mostly of ivory-like whiteness within, the backs of the thick, wax-like segments being more or less tinted with purple. Much may be made of yuccas by associating them in well arranged masses along with other distinct and gracefully habited plants, such as the pampas grass, *arundo conspicua*, hardy bamboos, dwarf fan palms, and a score of other valuable decorative plants too seldom seen in our gardens.

Our engraving shows how a shrubbery recess may be made a charming picture by the use of yuccas alone; and it is in positions such as these that the flowers show to the best advantage. The kinds here shown are *y. filamentosa* on the left, a kind which bears rather lax but graceful spikes of flowers. The central specimen is *y. aloiolia*, a form generally met with in cool conservatories, although perfectly hardy in sheltered positions; and it is a rather curious fact that the variegated form of this plant is found to resist cold better than the normal kind. Both, however, make noble plants. The right-hand figure represents the common Adam's needle (*y. gloriosa*), one of the most robust of all the species; and associated with it is the free and vigorous *y. recurva*. These last rarely fail to flower every year.—*The Garden.*



A GROUP OF YUCCAS IN BLOSSOM.

The Diamond Drill.

The diamond drill is now extensively used in preliminary mining, to ascertain the exact location and thickness of ore or coal at given points. It is not uncommon to bore into the sides of hills or mountains for hundreds of feet with a 2¼ inch diamond drill of tubular form. By this means solid cores or specimens of the borings can be had. Conglomerate rock cores, 12 feet in length, in one piece, have thus been obtained.

The Yarn Congress.

The second session of the Congress, held first at Vienna last year, to establish a uniform system of numbering yarn, has recently concluded at Brussels.

It was unanimously admitted that all textile fibers should be numbered upon one universal system; that the metric system is gradually becoming generally employed for weights and measures, and that it is the only one that is admissible in the reform sought for by this commission; that, although it would be possible to adopt one perimeter for all classes of threads, it is advisable to take into consideration established customs, and the difficulties that would have to be overcome in introducing so great a change; and considering that there is no real necessity for fixing in an absolute manner the reel perimeters for each class of threads, and, moreover, that the perimeter of the English reel for cotton of 1·37 meters (1½ yards) is that which offers the best chances of bringing England to admit the metric system, it is therefore decided:

1. That the international numbering of threads shall be based on the metric system.

2 The number of the threads shall be determined by the number of meters (meter 3·28 feet) of thread contained in a gramme, (15·43 grains).

3. The length of the skein admitted for all kinds of threads is fixed at 1,000 meters (1,100 yards), with decimal subdivisions.

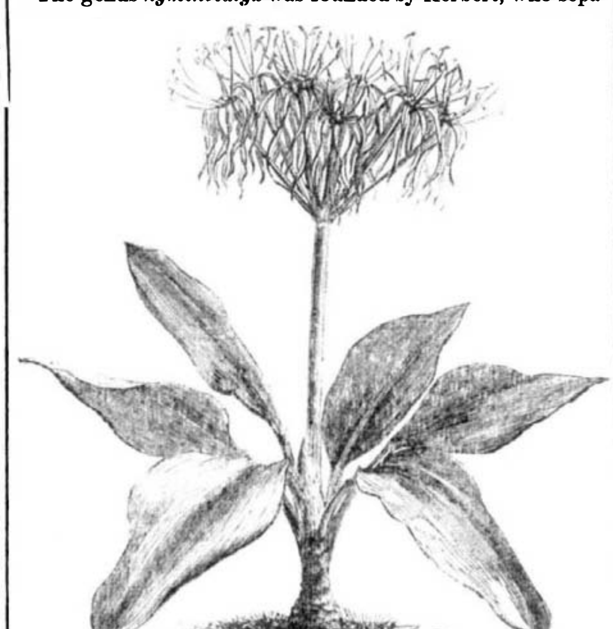
4. Any system of reeling, provided that it gives 1,000 meters of thread per skein, is admissible.

5. The numbering of silk threads to be 1,000 meters as a unit of fixed length, and the decigramme (1·54 grains) as a unit of variable weight.

6. In order to provide for the commercial relations of all countries, the scale of numberings for silk will be based on the variable weight of the unit of fixed length, and trials will be authorized on 500 meters (550 yards) weighing 50 milligrammes (0·772 grains).

THE HYMENOCALYX UNDULATA.

The genus *hymenocalyx* was founded by Herbert, who separated it from the genus *pancratium* of Linnæus. The species which forms the subject of this note (*h. undulata*, or *pancratium typhyllum*), is a native of Caraccas, New Granada, and is one of the handsomest stove plants in cultivation. From an elongated bulb, it sends up a stout compressed scape or flower stalk, about 1½ feet high, terminated by an umbel-shaped inflorescence, at the base of which are numerous scarious bracts of a greenish white color. The flowers are tubular, very fragrant, about 6 inches long, pure white, slightly greenish at the ends of the petals, which are five in number, linear in shape, reflexed and twisted, and from 3 to 4 inches long. "In the center of each flower," says W. M., an English amateur, "is a shallow cup, from which issue six long stamens. The leaves are radical, persistent, stalked, oval-elliptical in shape, and a foot or more in length; the leaf stalks are winged, and sheathing the flower stem." This very striking plant, the habit of which is well shown in our illustration, deserves more attention than it appears to receive at present. It is easily multiplied by separation of the young bulbs, which should be taken from strong plants after they have done flowering. It may also be multiplied by means of the suckers which the plant frequently produces.



Deep Mining.

Many of the leading mining companies on the Comstock lode are now down to the depth of 2,000 feet, and a few still deeper. When mining first began on the great lode, such a depth was not thought of, or, if thought of, no one expected to see mining operations carried to such a depth as 2,000 feet in less than fifty years. Now we not only do not feel startled at hearing the great depth of 4,000 feet spoken of, but when we see preparation in actual progress, for sinking that far, we think but little of it. The Savage company, whose works we yesterday visited, have broken ground for the foundations of new machinery, which is to be sufficiently powerful to sink their main incline to a depth of 4,000 feet. This incline is already some distance below the 2,100 foot level, and is still being vigorously pushed downward. The new hoisting machine will be supplied with two 24 inch horizontal cylinders, of 4 feet stroke, and will be of over 400 horse power. The foundations of this engine are being laid about 80 feet to the westward of the present hoisting works. A building, 50x60 feet in size, will be erected over the new hoisting engine and the machinery connected therewith. The carpenters are already at work framing the timbers for this building. The steel wire rope to be used is to be 4,000 feet in length, and will weigh about 24,000 pounds. It is now being manufactured by John A. Roebling's Sons, Trenton, N. J. It will be a round rope, and the upper end will be two inches in diameter, but 2,500 feet of its length will be tapered, and the lower end will be 1¼ inches in diameter. The reel on which this cable will wind and unwind will be conical, and the cable will wind about it spirally. The Ophir company contemplate the erection of similar machinery, and propose pushing their works to a like depth. The Crown Point company already have in operation machinery of much the same character as that being erected by the Savage folks, and having a cable of sufficient length to sink to the depth of 3,500 feet. The Hale & Norcross company, Consolidated Virginia company, and other leading companies at this end of the lode will erect similar powerful works, and will at once plunge down into the great unknown "depths profound," in which lie hidden the silver roots of the Comstock —*Virginia Enterprise.*

The Imitation of Lace on Silk by Photography.

A new and beautiful application of photography has lately appeared in England, by the aid of which any lace design can be transferred to silk, so that the latter material appears to be covered with the delicate and costly fabric. The lace to be copied is secured in a frame in contact with sensitive albumenized paper, and exposed to the light until a very deep impression is obtained. This is then fixed, and the paper, washed and dried, forms a perfect negative. Another piece of paper is then sensitized with bichromate of potash and gelatin, and exposed under the negative. Inking with lithographic transfer ink follows, and the paper is placed in water and lightly rubbed with a sponge. This throws out every detail of the inked spaces, the rest remaining white or free from ink. The impression is lastly transferred to a lithographic stone, and thence printed upon the silk by the usual process.

EIGHT pounds of oxygen gas and one pound of hydrogen are combined in nine pounds of water.

Spectroscopic Art in England and America.

Within the past few months, a series of independent efforts have been made in England and the United States, under the auspices of the two governments respectively, by able experimenters, to subject the spectroscope to practical purposes in the arts, more especially in the quantitative analysis of metallic alloys.

In England, the experiments have been conducted for the Royal Mint, by J. Norman Lockyer, the distinguished astronomer and spectrum-scientist, and William Chandler Roberts, chemist of the Mint.

In this country, the experiments were conducted on behalf of the United States Mint, Philadelphia, Pa., by Alexander E. Outerbridge, Jr.

The several experimentalists have, it appears, reached widely different conclusions.

Mr. Lockyer has announced that he is satisfied that by means of the spectroscope very minute differences in the composition of gold-copper alloys can be ascertained, but refrains from describing the process.

Mr. Outerbridge announces that a comparatively large proportion of gold may be present in an alloy, and the presence of the gold will not be indicated at all by the spectroscope. He also concludes that, in the present state of spectroscopic science, assaying by means of spectrum analysis is, for the present, impracticable for the purpose of Mint operations.

There appears to be as great a divergence on this subject between Mr. Lockyer and Mr. Outerbridge, as there is between Professor Tyndall and Professor Draper, on the subject of the heat power of the sun's rays, or between Professor Tyndall and Professor Henry, on the subject of the propagation of sound. When the doctors disagree, who shall decide?

The experiments of Mr. Outerbridge are confirmatory of a statement, made, we believe, by Professor Young, in reference to spectroscopic observations of the sun, to the effect that because we fail to discover the lines of carbon, silicon, oxygen, etc., in the solar spectrum, we are not warranted in drawing the conclusion that these elements do not exist in the sun.

Mr. Outerbridge has made a full report of his experiments to the chief assayer of the Mint, and he also gives, in a recent number of the *Franklin Journal*, a variety of interesting facts, from which we take the following:

The beautiful parti-colored band of light, resembling a section of a miniature rainbow, resulting from the passage of a ray of white light through a prism, is familiar to every one; this simple experiment forms an appropriate introduction to the fascinating study of spectrum analysis.

Every kind of light not strictly monochromatic may, by means of the prism, be resolved into its component colors. The spectroscope is a simple combination of prisms and lenses for the scientific examination of these different colors or spectra.

The numerous terrestrial elements, when in the state of incandescent vapor, give their own distinctive colors, which appear in the spectroscope as lines of light arranged in definite position, whereby each element may be easily recognized.

The passage of powerful electric sparks (from an induction coil), between two terminal points of the metal to be examined, vaporizes a small portion of the metal, and this incandescent vapor transmits to the eye of the spectroscopic observer its luminous autograph, which Nature never counterfeits. Should either or both of the metallic points, or electrodes, consist of an alloy of two or more metals, the autograph of each may be clearly read.

Mr. Lockyer noticed, while studying these luminous autographs, that when he separated the metallic electrodes, causing the spark to leap a greater distance through the air, the spectral lines no longer continued to cross the entire field of vision; but certain of them broke in the middle, and, upon further increasing the distance between the electrodes, the hiatuses in the spectral lines increased proportionately, but unequally with different alloys. As the proportion of either metal of an alloy is increased, its lines lengthen, and conversely with the lines of the other metal. Upon this discovery, Mr. Lockyer based the theory of a possible method of quantitative analysis.

The spectroscope was known to be marvelously sensitive to the impression of these autographs, and it, therefore, appeared plain that, could such a method of analysis be reduced to a practical basis, its value would be immense in assaying metals used in coinage. For although the present modes of assaying precious metals have been brought to great perfection, yet the process is slow and tedious, requiring many chemical operations and great delicacy of manipulation; and "there is something captivating in the idea of a determination, as it were by a flash of lightning or in the twinkling of an eye, what proportion of gold or silver is present in any bar or coin." It was with the hope of reducing this beautiful theory of Mr. Lockyer to practice that these experiments were undertaken.

A powerful induction coil, reinforced by Leyden jars, in connection with a two-prism Browning spectroscope, was employed, and it was found possible, after repeated comparisons of the spectra of different known alloys of gold and copper, to map the difference of fineness between specimens having respectively 500 and 750 parts of gold in 1,000 of the alloy, and even to recognize the variation between coin ingots 895 and 902 fine.

The spark, in passing through the air, vaporizes its constituents, namely, oxygen, nitrogen, etc.; these of course write their signatures in the spectroscope, and it is necessary to eliminate the numerous bright air lines which thus appear in all the spectra. Some of the lines of different metals appear in close proximity, and might readily be misinterpreted. Thus a bright blue line of bismuth is almost identical in position with one of zinc. A green line of iron is nearly coincident with a bright gold line. The difficulty which presented itself in the exact comparison of these proximate lines, was overcome by using a pure metal as one electrode and another pure metal as the other electrode. The effect thereby produced was very curious. With pure gold and pure copper as the electrodes, the gold lines extend across only one half the field of the spectrum, and the copper lines extend across only the other half, the medial termini of both sets of lines being perfectly sharp and bright. By this means a double spectrum of copper and gold is obtained, or rather a section of a complete gold spectrum and a section of a complete copper spectrum are visible in immediate juxtaposition, thereby enabling a most accurate comparison of lines, which in reality are not identical in position, but which by the previous method were apparently so.

By a slight modification of the experiment, substituting pure copper as one electrode and an alloy of silver and gold as the other, the proximate lines of these three metals are presented, mapped, as it were, on a natural scale.

By using as one electrode an alloy of gold and copper of comparative fineness, and a baser alloy of the same metals as the other electrode, a result not before observed presented itself. The lines of both copper and gold crossed the entire field of vision, but in the section representing the fine alloy, the gold lines were strong and bright; while in the section representing the base alloy, the gold lines were very faint.

By now gradually increasing the distance between the electrodes, the faint gold lines of the base alloy cease to join their bright counterparts of the fine metal at the central line.

The general principle was thus satisfactorily proved, that where two alloys of different grades are subjected to this treatment, the gold lines of the baser compound are noticeably the fainter of the two; and what is more important, they may be reduced in length by separating the poles, until they disappear.

Although Mr. Cappel has shown that 0·0162 of a troy grain of gold will show a spectrum, yet a comparatively large proportion of gold may be present in an alloy, the presence of which will not be indicated at all by the spectroscope.

In a slip composed thus: Silver, 708 parts; copper, 254 parts; gold, 38 parts: the spectra of silver and copper are alone visible.

In fact, in a base alloy of gold and copper containing from 20 to 25 per cent of gold, the gold spectrum is barely visible; while in a fine alloy of gold and copper, it was found that one per cent of the latter suffices to show the copper spectrum. Also in an alloy of nickel and copper, containing 25 per cent of nickel, its spectrum is scarcely visible. It seems evident, therefore, that the spark selects the more volatile metal as its vehicle.

If the spectroscope fails to reveal the presence of anything less than 200 parts of gold in a base alloy, even a theorist must admit that one could scarcely expect to be able to discriminate with certainty a variation of 1-10,000th in a fine alloy.

For the foregoing reasons, the conclusion seems inevitable, that, in the state of spectroscopic science as it now exists, assaying by means of spectrum analysis is, for the present, impracticable for the purposes of Mint operations.

Although these experiments have resulted negatively from the utilitarian standpoint from which they were undertaken, it is hoped that they may prove not altogether without value in a more general point of view. The fact that quantitative proportions of composite substances may be recognized at all, even to a rough degree, cannot but be regarded as a first step. All observations bearing upon the action of the spectral lines in indicating such proportions are at least worthy of being recorded. Not the least curious of these incidental observations is the fact that, while the spectroscope is sensitive to the minutest fraction of a grain of gold in the pure state or in solution, it fails to reveal the presence of a much larger proportion in a base alloy. Another is the fact that while the spark appears to select for its vehicle of transmission the more volatile metal in an alloy, and would thus seem to vaporize a greater quantity of the volatile than of the non-volatile component, yet in point of fact the loss of weight by such volatilization is in some instances much less in the former case than in the latter.

The rationale of these apparent paradoxes is not at present evident; but if we may judge by former experiences, in which problems even more mysterious have been resolved by study, we are warranted in anticipating that, when a large number of observations, to be made perhaps by many experimenters groping in the dark, shall be collated, the true scent may of a sudden be struck, which shall discover the desideratum of quantitative spectrum analysis.

A red hot iron passed over old putty will soften it so that it is easily removed.

Barytes Green or Manganate of Baryta.

This salt has been introduced into commerce under the names of Cassel green or Rosenstiehl's green. It has generally been prepared by calcining nitrate of baryta with oxide or peroxide of manganese, or by fusing caustic baryta with manganese and chlorate of potash. The author gives a new method for its preparation. On precipitating a green boiling solution of manganate of potash with chloride of barium, there is formed a deposit, strongly granular but not crystalline. This precipitate is of a violet color, bordering on blue. It is well washed by decantation, and then filtered. When dried, its color becomes paler as the temperature rises. At a dark red heat it is white, with a grayish blue tinge. If heated higher, with access of air, it becomes by degrees completely green, then of a fine blue, and at very elevated temperatures it is converted into a dirty brown gray. If a solution of permanganate of potash is precipitated with chloride of barium, and allowed to boil, there is slowly formed a reddish violet deposit (color of peach blossom), and the liquid retains an intense violet color. The precipitate may be washed by decantation, and filtered without decomposition. It can even be dried at 212° Fah. without losing its color. When gradually heated, the permanganate of baryta loses its color like the manganate, but at very high temperatures it behaves differently. When its color has once been destroyed by a moderate heat, it does not become either green or blue by further heating with access of air. The whole becomes at once of a grayish brown. The finest barytes green is formed by calcining the manganate of baryta. Rosenstiehl's process—the fusion of hydrate of baryta with chlorate of potash and peroxide of managanese—yields an inferior color.—*E. Fleischer, in Chemical News.*

Carbon Cells and Plates for Galvanic Batteries.

With a sirup made of equal quantities of lump sugar and water, mix wood charcoal in powder with about a sixth part of a light powder sold by colormen, called vegetable black. The mixture should hang thickly on any mold dipped into it, and yet be sufficiently fluid to form itself into a smooth surface. The vegetable black considerably helps in this respect.

Molds of the cells required are made of stiff paper, and secured by wax or shellac. A projection should be made on the top of the mold for a connecting piece. These molds are dipped into the carbon sirup, so as to cover the outside only, and then allowed to dry. This dipping and drying is repeated until the cells are sufficiently thick. When well dried they are then buried in sand, and baked in an oven sufficiently hot to destroy the paper mold. When cleared from the sand and burnt paper, the cells are soaked for some hours in dilute hydrochloric acid, and again well dried, then soaked in sugar sirup. When dry, they are then packed with sand in an iron box, gradually raised to a white heat, and left to cool. Should some of the cells be cracked, they need not be rejected, but covered with paper or plaster and dipped in melted paraffin.

Rods or plates of carbon can be rolled or pressed out of a similar composition, but made thicker. Carbon thus made will be found to have a good metallic ring and a brilliant fracture.—*W. Symons, in Nature.*

Ingenuity of a Spider.

A correspondent writes to *Nature* that a spider constructed its web in an angle of his garden, the sides of which were attached by long threads to shrubs at the hight of nearly three feet from the gravel path beneath. Being much exposed to the wind, the equinoctial gales of this autumn destroyed the web several times.

The ingenious spider now adopted a new contrivance. It secured a conical fragment of gravel, with its larger end upwards, by two cords, one attached to each of its opposite sides, to the apex of its wedge-shaped web, and left it suspended as a movable weight to be opposed to the effect of such gusts of air as had destroyed the webs previously occupying the same situation.

The spider must have descended to the gravel path for this special object, and, having attached threads to a stone suited to its purpose, must have afterwards raised this by fixing itself upon the web, and pulling the weight up to a hight of more than two feet from the ground, where it hung suspended by elastic cords.

New Compound from Urine.

The substance in question, $C_3H_8N_2O$, has a strong resemblance to hippuric acid. It forms white columns of several millimeters in length. Freely soluble in boiling water; sparingly in cold water and spirit of wine; insoluble in absolute alcohol and ether. If heated to 250° Fah. the crystals experience no change. If more strongly heated, they decrepitate, evolve dense white vapors of a peculiar odor, fuse, and finally burn with the odor of horn. It is neutral to test paper, does not combine with bases, but forms with acids salts which do not readily crystallize, and deliquesce on exposure to the air.—*F. Baumstark.*

ACID IN THE GASTRIC JUICE.—R. Maly finds that the pure gastric juice in dogs contains no lactic acid. The decomposition of chlorides by lactic acid cannot, therefore, be the source of the hydrochloric acid in the stomach. Lactic acid seems to play no part in the chemistry of the normal formation of acids. The source of the free hydrochloric acid in the stomach is a process of dissociation of the chlorides without the action of an acid.