Another Subway under the Thames.

An iron subway or tunnel under the river Thames just below Kingston Bridge has recently been completed for the Southwark and Vauxhall Water Company, under the direction of their engineer, Mr. J. W. Restler. The work has been carried out by Messrs. John Aird & Sons, who are the contractors for laying the main pipes of this company from Hampton to Nunhead, of which the subway forms a part. The necessity for the work has arisen from the circumstance that the population of the large district served by this company has greatly increased. The new scheme in its entirety consists of a cast iron main pipe, 42 inches in diameter, running from Hampton to Nunhead. In the tunnel the main is divided into two pipes of 31 inches diameter; but elsewhere throughout the length it is a 42 inch pipe. The main commences at the company's works at Hampton, and after passing under the river at Kingston it continues along main roads and across fields by Norbiton station over Coombe Hill via Ravnes Park and Merton Abbey to Tooting, thence via Streatham, crossing the Croydon Road and Streatham Common, to Tulse Hill, past Dulwich College, across Dulwich Park, and by Honor Oak to the Nunhead reservoirs of the Southwark and Vauxhall Water Company.

On the route between Kingston and Nunhead, the main passes five times through subways constructed under the London, Brighton & South Coast Railway and its branches. The total length of the main is about 151% miles. The tunnel is of a circular section, 9 feet in diameter, and is constructed of cast iron plates 1 inch thick, bolted together in segments, and in lengths of 18 inches. The method employed in driving

London Electric Railway from Stockwell to London Bridge. An iron shield of slightly larger diameter than the tunnel itself is forced forward into the clay by means of powerful hydraulic jacks, for a distance of about 18 inches, sufficient to insert one ring of the cast iron plates. The plates are then fixed and bolted together in position, and the shield impelled forward as before. This is the Beach hydraulic shield, an American invention, first used in constructing the short section of railway tunnel under Broadway, New York, 1869-1870.-Ed. S. A.] By these means the earth in the tunnel is taken out as nearly as possible to the precise dimensions of the iron ring to be inserted; but in order to make the work perfectly solid and secure, a grouting of liquid cement was forced in behind and around the ring when finally fixed, thus filling up every possible space, fissure, and crevice between the iron and the sur-

rounding clay. The progress made in this way was (Spilotes corais), and other snakes without rattles vivery rapid, as many as eight 18 inch rings or 12 feet of | brate theirs horizontally. Many African species seem tunneling being sometimes completed in 24 hours, the fond of hissing, and the American varieties of shaking whole work of tunneling under the river, a distance of their tails.

able circumstance, that the depth between the top of the tunnel and the bed of the river was in one place not greater than 2 feet 6 inches. The whole length of

contained in it. In the case of tea the proportion may vary from one to two parts of animal substance to ten parts of tea.-H. Grimshaw.

> CHARACTERISTIC POISES OF SNAKES, RY G. R. O'REILLY.

Snakes assume many attitudes when on the defen-



THE RATTLESNAKE IN THE ACT OF RATTLING.

sive, and show their excitement in many different ways. For instance, the rattlesnake does not hiss, but | feet in length and half an inch in diameter at his the tunnel and fixing the plates is similar to that vibrates the extremity of his tail, placing it in a some thickest part. His coloring is of the richest imaginable adopted in the construction of the City and South what vertical position, while the cribo, of Trinidad hues. The head and back are of the most beautiful

lapped round a branch, and saves his breath rather than waste it in hissing. The body of the boa is usually flattened at the points of contact with the limb, and this serves to give him greater purchase and a better hold in striking at his prey. The boa's head is always advanced.

The vipers, on the contrary, hold the head rather drawn back, and most of them keep it somewhat down. The terrible fer de lance, of the West Indies, and the labarri, of Demerara, as shown in the cuts given, remain carefully coiled. The traveler who has wandered on South American river banks will never forget the coiled death dealer labarri (Bothrops atrox), which, ready alike for enemy or prey, refuses to move from his path. In color he is like the dead leaves of the forest among which he lives. This renders him very difficult to see, and so adds considerably both to the apprehension and to the danger of hunters and others whose business or pleasure leads them to journey on foot through these tangled tropical wilds. When he strikes, his head, with perhaps two-thirds of his body, is shot out like lightning. This snake will strike again and again, unlike the rattlesnake, the bushmaster, and others that are usually satisfied with one injection of poison.

The fer de lance makes his home in the cane fields of Martinique. His coil is exactly like that of the labarri. And so with the bushmaster of Demerara (Lachesis mutus). The three last mentioned species all vibrate the tail. The coil of the rattlesnake is not so compact. Another snake that has a peculiar characteristic is the lora (Ahetulla liocerca), of Venezuela. He is a whip-like diurnal tree snake, of four or five

green. Along each side is a band of golden yellow and beneath he is of a mother of pearl white. His home is among the flowers of the vine-laced forest. There he lies in wait for his favorite prey, the humming bird, or chases the agile tree lizard from branch to branch. In Trinidad he is often seen in the gardens of 'he town of Port of Spain.

If you approach him too closely, he gets ready for defense in a strange way; for while other snakes as a rule keep their mouths closed, the lora, like a scolding wife or a noisy politician, keeps it open all the time, but all this fuss means nothing; as he is not poisonous and can kill nothing larger than a humming bird or a small lizard. His head is raised, flattened and drawn backward, and his apparently toothless mouth is ever constantly open to its widest extent. He bites fiercely, nevertheless, at whatever approaches him. The liquer (Dryiophis acumi-

A TREE SNAKE (XIPHOSOMA HORTULANA) COILED FOR STRIKING,

nata) acts similarly, but does not bite at all. Among the Elapidæ we find two of the most opposite manifestations, for, while the cobras flatten the neck and stand up perpendicularly, facing their assail-

about 190 yards, having been actually completed in 9 The boa constrictors hold the head well above the ant, the coral snakes neither flatten themselves out weeks. It may be mentioned, as a somewhat remark- ground, while the neck is bent into a series of S-like nor stand up, but lie as close to the ground as possible,



the tunnel is in the London clay.

To Remove Tannin from Tea.

The tannin present is absorbed by means of suitable animal substances, such as horn shavings, dried albumen, hide clippings, and the like. It is preferable to add the material to the tea in the dry condition before the infusion is made. But it may also be added to

THE COIL OF THE FER DE LANCE (VENOMOUS)

THE LABARRI (VENOMOUS) READY TO STRIKE.

the infusion, or the infusion may be passed or filtered | curves, as may be seen in the engraving of mapanari, subjected to the action of seaworms, should first be through a layer of the substance The quantity of Kiphosoma hortulana, a tree boa of South America, charred, so as to kill any germs near the surface, open animal substance to be added to the tannin-containing a bold biter, who considers excitement in a warrior in the pores of the wood for the antiseptic and destroy material must be determined by the amount of tannin judicious. Consequently he keeps his tail quietly the nutritive matter upon which the worms live.

snake of Trinidad, flatten themselves out as if they had been pressed.

with the head placed

sideways to the object

Most snakes inflate

themselves somewhat

when excited, but some,

like the small 'water

of danger.

They neither hiss, at least audibly, nor vibrate their tails. This water snake is the only one I know that can actually jump. I have known one ten inches long to jump fifteen inches from the ground.

IT has been concluded that whatever preservative is to be applied, the timber for piles,

The New German Patent Law.*

On October 1, the patent law of 1877, under which figures is noteworthy. patents are now granted in Germany, will cease to have effect, and after that date protection will be afforded to inventors by two laws much more liberal than the law now in force.

patent law of April 7, 1891. The provision of this law that is most important to American inventors is the has been an increase as compared with 1884. The apsecond clause of paragraph two, which provides that plications for designs, which amounted to 19,515 in copies of patents officially published in the United 1884, increased to 25,923 in 1888, from which amount States and other foreign countries shall not act as a they declined to 22,235 in 1890. The applications for bar to the grant of a patent in Germany for the same trade marks, which amounted to 7,104 in 1884, increased invention until three months after such publication. to 13,315 in 1888, from which point they declined to Under the law of 1877, now in force, the American in- 10,258 in 1890. A more distinct idea of the growth of ventor must file his application for a German patent on invention in Great Britain. however, will be gathered or before the date of issue of his American patent. It from a comparison of the figures of 1852 with those of frequently happens that an inventor, desirous of pro- recent years. In the former year 1,211 applications tecting his rights in Germany, does not know this and were received, upon which 914 patents were granted. allows his United States patent to issue before he In 1839, the last year for which complete statistics are decides to apply for a German patent, and when he at hand, there were 21,008 applications for patents, does apply he is invariably refused. After October 1, upon which 10,624 patents were granted. The increase however, inventors will have three months after the in the number of applications and of patents granted issue of their patents here in which to make applica- has been most marked since the year 1884, the first tion in Germany. As not more than three or four year under the patent act of 1883. The growth under weeks are required for the preparation of an applica- the act of 1852 was constant but gradual. The applition and its transmission to Germany, two months or cations for patents grew in number from 1,211 in 1852 more remain after the issue of the American patent in to 3,490 in 1862, to 3,970 in 1872, and to 5,993 in 1883, the which to decide whether it is necessary or expedient to last year under the old act. The patents granted in secure protection in Germany.

importance as to be worthy of special attention. The new act, the applications jumped at once to 17,110, or first of these provides that no patent which has been nearly three times the number for the preceding year in force for five years from the date of allowance while the patents granted amounted to 9,984, or about thereof can be annulled for lack of novelty at the time two and a half times the number for the year precedof application. No other country furnishes such a ing. This remarkable advance is attributed to modi guarantee of the validity of a patent. The second fications in the new patent law in the direction of simprovision is that publications over 100 years old can-|plification of procedure and diminution of the initial not be cited against applications allowable in other respects. The third provision is that a patent for an the proportion of patents granted to the total number improvement on an invention patented in Germany of applications is considerably smaller under the actof becomes a principal patent if the principal patent is 1883 than under the act of 1852. Patents were granted declared void. Under the present law a patent for an upon about three-quarters of the applications in 1852, improvement expires with the principal patent.

In order to enable the inventors to receive protection on inventions of minor importance, a law for the protection of useful models, supplemental in its workings' side, and they disclose some interesting facts. Natuto the patent ' " has been formulated, and will also rally the greatest number of applicants reside in Engtake effect c October 1. Under this law the benefit of land and Wales, which furnish about two-thirds of the an invent on of such nature that it would not pay to protect it by letters patent, on account of the heavy furnishes the largest number of applicants, and shows annual taxes, can be enjoyed for six years at a comparatively small cost. This law will undoubtedly be made use of quite extensively by inventors and manufacturers who are satisfied to be protected for a short term of years, as the rights obtained are the same as granted to holders of letters patent. In fact, the law is even more liberal than the patent law, as no examination is made regarding the novelty of the invention embodied in the model.

law the time within which an appeal can be taken in 1890. Next in order come France, which shows slight after the rejection of an application remains the same fluctuations, and Austria, where, though the number appeals will be necessary as often as under the present | crease than in the case of France. The British colonies law, as the prime cause of rejection, lack of novelty, is send a fair number of applications, Canada taking the almost entirely removed by the three months clause. The disastrous effects produced under the present law by allowing to a foreign inventor but four weeks in which to receive and reply to a notice from Germany will therefore probably entirely disappear under the Japan, New Caledonia, from the Sandwich Islands, and working of the law soon to come into force.

The passage of these two laws marks a long step forward, and shows that Germany recognizes the importance of being liberal, not only to her own inventors, the report show that Great Britain is not lagging bebut also to those of foreign powers. American invent- hind in the march of inventive progress.-Bradors will undoubtedly appreciate the importance of street's. the changesthat will be effected, as the new laws will do away with most of the drawbacks connected with the present German patent system.

Four Decades of the British Patent System,

for the last four decades. The progress shown by these

Glancing, in the first place, at the figures for 1890, it appears that the number of applications for patents has shown a steady increase, amounting to 21,307. as against 17,110 in 1884. There has been a falling off as The first and more important of these laws is the compared with the four preceding years in the number of designs and trade marks applied for, though there creased in number from 914 in 1852 to 2.191 in 1862, to Three other provisions of the new law are of such 2,771 in 1872, and to 3,962 in 1883. In 1884, under the cost of protection. It will be noticed, however, that but only upon about one-half in 1889.

Some figures are given in relation to the countries in which the applicants for patents in Great Britain renumber. Among foreign countries the United States the greatest increase in the number of applications under the act of 1883. American applications numbered 1.181 in 1884; in 1890 they numbered 2.597, or more than twice as many. This is not surprising, in view of the position held by the United States as an inventing country. Germany ranks next to the United States in the list of foreign countries furnishing applicants for British patents, but it has not shown the same rate of increase as the United States during recent years, Although it is to be noted that under the new patent the increase being from 890 applications in 1884 to 1,336 -namely, four weeks—still it is hardly probable that of applications is small, it shows a more marked inlead, with Victoria second, and New South Wales third. Comparatively few applications come from the in their own way. This is what we have styled a pat-South American countries. Applications, though few in number, have been received from Persia, China, even from Fiji, though but one application from the last mentioned place has been received during the last six years. Taken altogether the statistics embodied in

Volatilization of Iron.

Quite recently Messrs. Mond and Quincke discovered nection with the development of nickel plating. At that time the experimentalists failed to obtain any similar compound of carbon monoxide with another metal. Considering it strange that nickel should be the only metal capable of entering into combination with this particular gas, they persisted in their investigation, more especially with iron, under very varied conditions; and they have at last succeeded in demonstrating the fact that iron is volatilizable, although apparently in very small quantities, in a current of carbonic oxide. This result was communicated to the Chemical Society, and the particulars of Messrs. Mond and Quincke's experiments are reported in the Journal of the society. Suffice it to note here that they volatilized some finely divided iron in a current of carbonic oxide at ordinary temperatures; the deposits from this process giving all the known reactions of iron in re markably brilliant colors. The practical importance of this discovery may or may not be considerable, as further research will be needed to establish the conditions under which the action can take place.

Patent Rights and Wrong.

The London Journal of Gas Lighting, in a recent issue, gives a review of the present patent systems, from which we abstract the following :

The British trick of grumbling at everything, and incessantly tinkering away at every established system with a view to keeping it up to popular requirements, is apparently as foreign to the American as it certainly is to the French spirit. The condition of the great American patent system is an example in point. Those who praise it in the extravagant way sometimes heard know nothing about its practical operation. As a matter of fact, it is extravagantly costly to the country, if not to the patentees, and but that any excusable outlet for revenue is desired by the Federal government, the working of the Patent Office would be speedily overhauled. The system of prior examination, of which apologists make so much, is utterly useless, since no guarantee is attached to it, and it only causes vexatious delay in obtaining protection, besides being very expensive. Then the absence of any machinery for removing merely obstructive patents has been already remarked.

The British patent system is anything but perfect, but then nobody pretends that it is. The American system is full of defects, and it is considered treasonable to hint at the existence of a single blot upon it.

We in England have not yet been persuaded by Sir Frederick Bramwell, and by those who think with him in this matter, that patented inventions are absolutely unmixed blessings, and that to invent something patentable is the first duty of man. Indeed, the day of cheap patents in which we now live has brought into prominence certain aspects of patented inventions which are not altogether pleasing to individuals or wholly subservient to the best interests of the community.

The facility with which patents can now be obtained is fostering a novel description of public nuisancethe patentee of "unconsidered trifles," several illustrations of whose vagaries have been recently brought to our notice.

A business firm will patent a variety of construction which other people would regard as a trifle or as common property.

There is yet a hazy impression upon the public mind—the remainder from an earlier state of things that a patent article must somehow be better than one which cannot be so described. This superstition is fast dying out-thanks, mainly, to the indiscriminate traders who have worked it to death by dubbing everything they sell "patent," merely by way of excuse for their dearness. Until it is quite gone, however, it is clear that a trader has a perfect right to take what advantage of it he can, by patenting all sorts of things merely for the sake of being able to advertise them as such. Thus, for example, if a stove manufacturer discovers, in the ordinary course of business, that a "patent" stove is looked upon with more favor by purchasers simply on account of this designation, he can hardly be blamed for patenting anything and everything of this class which can be made to pass muster at the office. This is a very different thing, however, from a patent for a method of constructing an engineering work, intended to restrict the liberty of designers, and make them ask permission of the patentee to be enabled to do their work ent outrage.

When a man has invented a new and improved way of doing anything, it is but right and reasonable that he should have at least the credit for the suggestion. and as much profit as the idea can bring him. But for a man to appropriate, by the complaisance of the Patent Office, a notion which is neither better nor worse than many others of the same class or a device which is rather an alternative to ordinary methods than an improvement upon them, and to make this appropriation a means of tying the hands of designers who do not seek to captivate the market, but that nickel combines with carbon monoxide to form a only to do their work after their own fashion, is a piece nickel-carbon oxide, which promises to be useful in con- of impertinence that requires checking before it grows commoner than it is. It may be asked how the line is to be drawn in this regard between what is a distinct improvement and what is merely an alternative. But the distinction, if not easily defined, is easy to understand. If, for example, a gas engineer wishful to erect a gas holder is informed of a method whereby the work may be done at considerable saving of expense or of time, he may be willing to pay a reasonable proportion of the estimated saving for the privilege of using the new method, and will not object to it as being temporarily private property. Should he, on the other hand, propose, for his convenience, to make a change in the design which is of no particular advantage in itself, he will naturally be wroth when told that some gas holder maker has appropriated the idea, and will either grant him a license to use it, for a consideration, or will graciously waive the claim upon securing the contract for the erection of the holder. This is the sort of thing that inclines people to ask whether, after all, a patent system is not of more harm than good to the public.

As our readers know, the two great English-speaking countries, the United States and Great Britain, lead the world both as regards the number of applications for patents and as regards the number of patents granted. The United States, of course, stands first in the list and Great Britain second. The history of the patent system in the United States has been recently recounted in these columns, on the occasion of the meeting of the congress of inventors and manufacturers, held at Washington, to celebrate the centenary of the American patent system. A report has just been made public in England which gives a less comprehensive but still most interesting account of the history of the British patent system in times comparatively recent. This is the report of the Comptroller-General of Patents, Designs, and Trade Marks for the year 1890, which, in addition to the statistics for that year, gives figures showing the progress of the patent system in Great Britain since the year 1852, or, roughly speaking,

*C.S. Champion, in The Iron Age.

The Law of Natural Gas

Gunnison in the case of a consumer at Erie, Pa., who crime, because it is necessary, in order to convict a dies. The commercial hydrochloric acid, commonly was accused of improper use of natural gas, and found guilty.

"Larceny is the felonious taking and carrying away of the personal property of another. You have heard the ruling of the court upon the question raised by counsel for the defendant, in which it was decided, in accordance with the decisions of several other courts of this State, that gas in the distributing pipes of the gas company is personal property, and the subject of larceny. Gas in the ground before the well is drilled stances, and that one circumstance would be sufficient will happen, but if the calico is taken out, moistened, would be real estate or a portion of the real estate. But when the well is drilled and the gas flows from the well into the pipe, what is called in law a 'severance' takes place. The gas is severed from the real estate, and thereupon becomes personal property. In the same manner, to take apples from a tree in an orchard is not larceny, because they are a part of the real estate when attached to the tree; but when the apples are severed from the tree and fall to the ground, to pick them up with the purpose of appropriating them to one's own use might be larceny, because the apples being then severed from the tree become personal property. As long as gas is stored in the earth. it is real estate; it is a part of the earth; but when it becomes severed from the earth by being taken into the distributing pipes of the company and brought (as in this case) 80 miles from where it was stored in the earth, it becomes personal property and is the subject of larceny. So that if the defendant is guilty of feloniously taking and carrying away the gas of the Pennsylvania Gas Company, in the ation in which this was, is personal property and pro- cal growth of children have been conducted in the city of Erie, where it has been brought by pipes, he is guilty of larceny.

"The testimony introduced on the part of the commonwealth is to the effect that upon October 1 this defendant appeared at the office of the company, he having been before that a customer of the company and one to whom they had supplied their gas, and notified them to disconnect his stove from the pipes. That thereupon they sent a man to his premises who took away the mixer (which you probably all know is the globe or bulb attached to the pipe just before the is the most important member of the halogen group. point at which the gas enters the stove). That they detached the mixer and disconnected the pipe from the stove to prevent the gas from escaping. That, on February 12, when one of their employes visited the premises of the defendant, they found the pipe connected with the stove again, and a piece of pipe with holes drilled in it, to mix the air with the gas, attached to it, and a fire burning in which the fuel used was gas. He says that he turned the gas off and turned it on again and lighted it, and found that it was gas. Now it is a principle of criminal law that a person found in possession of stolen goods must give a satisfactory account of his possession, or that possession will be taken as evidence of guilt. The defendant has introduced no testimony and called no witness to make a satisfactory explanation of the presence of the gas which was burning in the stove during this time. Of course, there is the evidence of Mr. Walker, who tells you that at the office of the company the defendant told them to disconnect the gas on these premises, but that is the only evidence that shows it was in his possession or that he occupied these premises, because all that the other witnesses know about it is hearsay alone. They got word at the office to go and turn off the gas at Mr. Nicholson's place, but that would be all tion. Many bodies burn readily in it, as is shown in hearsay. But the testimony of Mr. Walker is to the the case of copper leaf, finely divided antimony, and effect that the defendant himself came to the office would be evidence against him. It might be possible else. that the gas was not burned there with his knowledge and consent. There is no direct evidence that he ever saw the gas burning there, or that he knew of it. The circumstance that the gas was found burning on the

cumstances, and if the circumstances satisfy you the gas to show its solubility and acid reaction. beyond a reasonable doubt that he had knowledge of Chlorine gas is a great bleaching agent. This power be acquitted.

personal property, and as such personal property is the Science News. subject of larceny at common law.

"That point is affirmed; but you are instructed by the court that in our opinion natural gas, in the situperty of value. The fact that an amount of small value nature of the transaction at all. Larceny can be committed as well of one cent as of \$1,000; the crime is the about the costs."

Chlorine. BY GEORGE L. BURDITT.

Chlorine. one of the most abundant of the elements, The other members of the group are bromine, iodine, and fluorine. Their characteristic features are their the metals with which they unite to form a class of salts.

1774, but it was first recognized as an element by Davy dium chloride (Na Cl) is the principal source. It is Swedish children observed by him. also made by the following reaction : $4H Cl+MnO_2 =$ water, and the solution which is readily formed by shaking the water and the gas together has the odor, color, and taste of the gas. In consequence of this solubility it cannot be conveniently collected over water. The common method is to collect it in dry combustible, although it sometimes supports combusarsenic.

Chlorine combines with all non-metallic elements, 'investigations will be required to determine this point, forming an important class of compounds, called chlorides, all of which—with the exception of argentic, the present investigation having been made on not chloride, cuprous and mercurous chlorides-are more more than twenty-five hundred persons, including premises and connected with the stove would be a or less soluble in water. To test a solution for a both sexes .- Prof. Gerald M. West, in Science. circumstance from which you might legitimately infer chloride, add argentic nitrate. If a chloride is present ----Two Cylinders in One. that it was he who did it or it was with his consent it a white precipitate will be formed. This is argentic was done. The indictment charges him with having chloride, which is insoluble. The commonest chloride A new departure in compounding locomotives, which taken 120,000 ft. of gas. It is not requisite that the we meet with is chloride of sodium (Na Cl), or common is almost as radical as the idea of compounding itself commonwealth prove that he used all that amount; if salt, the properties of which are well known. The was, has been put into practical and successful operablowpipe test for a chloride is as follows: Make a tion by F. W. Johnstone, superintendent of motive borax bead and add oxide of copper, then add the sub-power of the Mexican Central Railway. Coal costs stance to be tested. If it is a chloride, a beautiful about \$11 per ton on the Mexican Central, and Mr. Johnstone undertook to reduce fuel consumption by bluish green flame will be given.

crime, although he might be liable civilly for the gas powerful and gives a strong acid reaction. It dissolves The following charge was given to the jury by Judge that was taken, but he would not be guilty of any many metals, setting free hydrogen, and forms chlorman of crime, to show that he had a guilty intent, and called muriatic acid or spirit of salt, is generally yelif it was done in his absence, when he knew nothing low, owing to impurities. The pure acid is colorless. about it, he would not be guilty of any crime. But A little concentrated H_2SO_4 added to about three intent is something that may be inferred from the cir-| grammes of salt in a test tube will generate enough of

> the fact that this gas was being burned there, then depends upon the fact that chlorine has a greater you might properly infer that there was a guilty intent. affinity for hydrogen than for oxygen. If a dry piece Intention is a subject of proof by means of circum- of calico is suspended in a jar of chlorine gas, nothing from which to infer that intent, if you find that it was and put back, it will be quickly bleached. The chlorwith his knowledge and consent. You cannot find, ine in the jar combines with the hydrogen of the water however, from mere suspicion; you must find it upon on the cloth, and decomposes the water. The oxygen evidence, and if there is a reasonable doubt in your freed from its former combination unites with the minds arising from the evidence, such a doubt as a coloring matter on the calico and removes it, leaving a man of ordinarily good judgment would act upon in white cloth. Bleaching powder, Ca OCl₂, is commonly matters of importance to himself, that reasonable used. It is frequently, but improperly, called chloride doubt should be given to the defendant, and he should of lime. When acted upon by an acid it gives chlorine. The cloth to be bleached is first immersed in a solution "Counsel for the defendant asks the court to instruct of bleaching powder, and then dipped into dilute sulyou that in order to convict the defendant of this phuric acid (H₂SO₄). Chlorine is generated, and the charge the jury must be satisfied beyond a reasonable cloth is bleached. This method is much better than doubt that natural gas in pipes, such as is shown by the use of chlorine gas, because it gives only the the evidence of the prosecution, is such personal amount of chlorine needed, and only at the place property as comes under the common law definition of where it is needed—in the fibers of the cloth.—Popular

Growth of the Face.

During the past year investigations upon the physi-Worcester schools. The preliminary tables on the is proved to have been taken does not change the growth of the female face bring out some facts of considerable interest. There seem to be three distinct periods, the first ending about the seventh year, and same. This being a felony, you have nothing to say the third beginning about the fifteenth year. A striking peculiarity is the seemingly abrupt transition from the types of one period to those of the succeeding. The sudden disappearance of the lower widths of face, and the equally sudden appearance of the types of the succeeding period, e. q., the sudden shooting up of the widths to almost adult dimensions at about the age of 8 or 9, offset by the equally sudden disappearance of the distinctively childish characteristics at indifference to one another and their affinity for the age of 11. These peculiarities also appear at the ages of twelve and fourteen respectively in the succeeding period. This would seem to indicate the very Chlorine (Cl₂, 35:5) was discovered by Scheele in slow growth of some children until the ages of about eight and fourteen respectively are reached, and then in 1810. It never occurs free in nature, but exists in a very rapid development of each individual to her large quantities in combination with sodium, potas-proper position in the series. This Axel Key found sium, calcium, magnesium, and other elements. So-lalso to be true with respect to the total height of the

In the second period very many of the forms are $MnCl_2+Cl_2+2H_2O$. The chlorine thus produced is a already adult, and if not at their fullest development, green or greenish yellow gas, with a powerful, suffo- have very nearly approached it. From the fifth to cating odor. If breathed in small quantities it pro-the tenth year inclusive the growth is somewhat duces irritation of the air passages and coughing. slow, about 6.5 millimeters in all, but for the next Chlorine is soluble in about one-half of its bulk of cold four years, the period of adolescence, the growth is 6.2 millimeters. From the fourteenth year on there is very little advance, the maximum seeming to be reached at about 128 millimeters in the twentieth year. On comparing this growth with that of the male face some differences are noticeable. The male face is, with bottles by downward displacement. Chlorine is not perhaps a single exception, larger for the same period of life, and for the same years it appears to grow more rapidly and continues to grow later in life. Massing the cases after twenty, the advance is seen to be far Chlorine is valuable as a disinfectant, a beyond the breadth attained at nineteen, rising to and told them to turn off the gas, and that he gave bleaching agent, and an oxidizing agent. Its strong about 138 millimeters. At about nine years the two the building and the rooms which he occupied, and attraction for hydrogen causes it to decompose water types approach very near, and it is not at all unlikely that his declaration that he occupied the rooms and set free oxygen which may unite with something that, as found in the case of height by Bowditch in Boston and Peckham in Milwaukee, the female face may for a short period become the broader. Further

they prove he used any gas at all, it will be sufficient. Frequently an indictment is found against a man for stealing a large amount of property, and when the proof is presented there may be only evidence to show that he stole one or more of the articles alleged to have been taken: but it is not necessary to prove that he stole all the articles named in the indictment. So if you find this gas was being burned in these premises by his knowledge and consent, in the absence of any testimony to contradict it or to explain the situation and the transaction, you will be justified in finding that he is guilty. It would be sufficient proof to justify such a verdict.

But, as in all other criminal cases, before returning

The most important combination of chlorine with the introduction of a compound system of his own, in the non-metallic elements is its combination with hywhich the high-pressure cylinder is encircled by the drogen to form hydrochloric acid (H Cl). Equal low-pressure cylinder.

volumes of hydrogen and chlorine may be mixed to-The high-pressure cylinder is 14 inches in diameter, gether in a vessel, and no action will take place while and the low-pressure cylinder has a diameter of 30% the vessel is kept in the dark. But as soon as it is exinches, which is equal to a cylinder 24¼ inches in diaposed to direct sunlight, a loud explosion takes place. meter. The stroke is 24 inches, and the two rods of The gases unite, forming a colorless but strongly acid the low-pressure piston are coupled with the single gas-hydrochloric acid gas. It fumes strongly when ex-|high-pressure rod to one crosshead. In a competitive posed to the air. A solution of this gas in water makes test of 12 trips with a single engine, the compound a verdict of guilty you must be satisfied beyond a hydrochloric acid. The gas is very soluble, water locomotive showed economy in fuel of about 25 per reasonable doubt that it was burned with his know- dissolving about 450 times its own volume of it. It is cent, which means a great deal on a road where the ledge and consent; because if it was done without his usually made from common salt: 2Na Cl+H₂ SO₄=Na fuel account is the largest item of operating expenses, knowledge and consent, he would not be guilty of the H SO,+H Cl+Na Cl=Na, SO,+2H Cl. The acid is being 22 per cent of the total.