The art of refining oil was unknown to the ancients. As an especial luxury they mixed their oils with the essence of roses and with sandal-wood, which, however they disguised the bad odor of the oil, only diminished the strength of the light. The historians mention that Lucullus, and others, spent large sums for these perfumed oils, and yet the illumination of our most modest of shops and stores is of course far superior to that of the most magnificent of the palaces of ancient Rome. The gold and silver lamps were hung on fine worked chains from marble pillars, but the flame was small, and, besides smoking excessively, it flickered or went out entirely in a slight current of air.

From Rome the oil lamp passed into France, Germany, and England, where the pinewood chips, and wicks soaked in fat, were still in use. The inhabitants of Denmark, Scandinavia, and Scotland, when in want of pine wood, caught some fat bird, or other greasy animal, and set fire to it, and patiently endured the smell emitted from the burning carcass until it was burned to ashes.

The Roman lamp underwent but little change until the discovery of the tallow candle. The spare illumination explains in some measure the sober habits of our ancestors. They arose with the break of day, and retired when the present generation begins to get ready to go to places of amusement. The "curfew bell," derived from the French word *couvre-feu*, was not without its signification. Under William the Conqueror, every light had to be extinguished at eight o'clock, and no one was much incommoded by this law, for the people were generally too poor to pay for an extra quantity of oil.

The first step to introduce the tallow candle, was taken in the twelfth century, when the tallow torches came into use; during the following century the tallow candle was brought before the public, much in the same form and shape which it bears at the present day, only they used a flaxen wick, cotton being unknown at that age. These candles were, however, considered a great luxury, and used only by persons of high rank. Some fifty years later the wax candles were manufactured for the courts and royal palaces. When they were first used in churches their cost was enormous. A wax candle offered on the altar to the praise of God was considered a royal gift.

The price was still high up to the sixteenth century. The anecdote related of Oliver Cromwell, who one day found two wax candles burning upon his wife's toilet table and extinguished one, shows that even among the rich illumination formed an important item in the household budget.

The eighteenth century brought an essential change in this necessary household article, caused by the discovery of rape oil; olive oil had till then been used in Italy and France, and whale oil in the North; but rape oil was much cheaper, and thus afforded an opportunity to the poorer class to enjoy the the comfort of an oil lamp.

In the year 1783, the first great reform in the construction of oil lamps was devised. A Swiss, named Argand, who had been adopted by an Englishman in London, was the inventor of the cylinder-formed wick, which moved like a tube between two metallic pipes. This mechanism allowed an even current of air to feed the flame, the smoking of which was obviated by the addition of a glass cylinder, which latter not only prevented smoke, but also diminished the disagreeable smell of oil, and more than all, caused an increase in the strength of the light.

This new invention soon came into general use. The Gerard Brothers improved it greatly by placing the oil receptacle below instead of above the flame, which gave to the lamp a much more graceful form. They also introduced the milk-glass shades to break the glaring light. The next improvement appeared in the "Carcel" lamps; the "moderators" soon followed, which latter is still in use in many places where oil is burned.

With the improvement of lamps refining of oil also underwent an essential change. In 1790, vitriol was used in purifying oils, an invention which was made almost simultaneously in France and England. With every year the number of substances from which oil could be obtained was increased by new discoveries; but all these inventions were left far behind after the discovery of petroleum wells in America in 1845.

But tallow and wax, and even the most refined oils, are far surpassed by the gas light. The first attempts to burn gas were made by an Englishman named Murdoch, who distilled gas from coals and with it illuminated his house. In 1804, Mr. Murdoch introduced it into a factory at Manchester. A few years later the first gas company was organized in London, where it has been in use ever since. The fast progressing civilization of America did not tarry long in adopting this new invention, and the improvements in the art of illumination, which in America are almost a daily occurrence, prove that this western hemisphere will never have to pass through such an ordeal of darkness as that which for centuries has been allotted to the eastern world.

In the days of Shakespeare the theaters were illuminated by tallow candles, and the actors had to come forward between the acts and themselves perform the work of snuffing the candles. This always occasioned a great deal of merriment among the audience, who, having a moment before been moved to tears by their tragical speeches, were made to witness such a menial performance. To such Hamlet's and Othello's, our sperm candles and petroleum lights, not to speak of the gas, would doubtless have appeared as a gift from Heaven.

Some fifty years have passed since gas was first introduced and already dangerous rivals threaten to take its place. The electric and calcium lights, and various kinds of gas have been tried with very considerable success. Nobody believes, however, that the art of illumination has arrived at its climax of perfection. Undoubtedly the time will yet come when our city streets, bridges, and tunnels, will be lighted in a style scarcely inferior to daylight, a *desideratum* which might even now be attained were our officials as anxious to serve the public as to fill their pockets.

[For the Scientific American.]

THE CALABASH TREE.

BY JOHN RAMSAY GORDON.

The calabash tree is of the *genus* known to botanists as *Crescentia*. It grows in the tropical countries of South America, and also in the West Indies, in which parts it flourishes profusely. This tree attains a hight of thirty feet and arrives at a moderate age. The trunk and branches of it are very tough and ligneous, and the bark is very irregularly distributed on them, being found thicker in some parts than in others. As the branches are, in comparison with the trunk, disproportionately thick, they thus have a clumsy appearance, which is increased by their being studded with irregular protuberances throughout their entire length. They have a tendency to bend in the opposite direction to that from which the wind blows. Thus in the West Indies, where the prevalent wind is from the east, the branches of this plant are mostly curved towards the west. The leaves are of an oblanceolate form and of a dark green color. They do not grow in clusters like most others, but proceed separately from the branches, and even from the trunk, at almost regular distances on them. The flowers are of a pink shade streaked with lines of a brownish tinge. After the decay of these, nuts appear on the same stalk. The nuts are ellipsoidal in shape and are of a woody consistency. They extend in size from that of a walnut to that of a large pumpkin.

These nuts contain a pulpy kernel, in which there is an innumerable quantity of small flat seeds. When they are young they are perfectly green, but as they become older they assume a darker hue; and, although when unripe they can be penetrated by a penknife, yet they can only be divided by means of a saw, or some other forcible alternative, when they have attained maturity, as they are then of the woody consistency before mentioned; and, indeed, they are so hard, that the instrument employed in cutting them is very often blunted during the process.

In the West Indies, the natives convert the nut of the calabash tree into household utensils of many kinds. Of them they make drinking cups, sugar pots, baskets, divers ornaments, and dippers for water, and such are procured from the small nuts; of the large ones they make bath tubs for their infants and wash tubs for their clothes. The manner of preparing these nuts employed by them is as follows: They obtain a saw and cut out the shape of the article they require; then they extract the pulpy kernel, which they generally reject, and with a knife they scrape the inside of the nuts until they have cleared it of moisture; next, they scrape the wood of the interior with a piece of bottle-glass and polish it with sand paper. After this process has been completed they place them in boiling water, which they assert prevents them from becoming black within. If the exterior of the nut be required to be scraped, it is done before the hot water is applied.

Some of the aforenamed articles are painted with a variety of colors, but such consist only of the ornamental kind. Those that are intended for drinking purposes are not colored. The drinking vessels are formed by sawing off one end of the nut or by dividing it longitudinally, and, in the latter case, two vessels are obtained from one nut. The sugar pots are formed by sawing off the end of the nut and employing the piece which is cut off as a cover to the vessel, and it is attached to it by means of a bit of string. These articles they call their "Gobis" or "Govis." The dippers are formed by taking away a portion of the end of the nut, and inserting a wooden rod in a small hole in the side of the nut, to serve as a handle.

Some of these articles of household furniture are very tastily manipulated to captivate the eye. In the absence of a saw the negroes employ a piece of string and a stone to divide these nuts, and this is effected by tying the string round them and tapping gently with the stone on it till it enters; it is a tedious process but is often successful.

The kernel of the calabash is boiled into sirup by the natives, and it is asserted that this sirup is very beneficial to consumptive invalids, as it has a soothing quality. Occasionally the pulp is given to goats who are exceedingly fond of it and eat it with avidity.

The calabash tree is the haunt of iguanas, snakes, lizards, and all kinds of reptiles, which exist on the flowers, of which they are very fond.

On the subject of the foregoing article, the calabash tree, the works of the celebrated French writer, Pierre L'Abbat, are very interesting, and I think are worthy of perusal.

About Water Supply-Pipes.

A correspondent in the *Herald of Health* makes the following inquiries, and to which the editor sensibly answers:

"What can I use as a water supply-pipe? Is gutta-percha the best? How is galvanized iron? Is there not mischief in it, or in the zinc used to whiten it? Pure block tin is not to be had, for they will mix lead with it when the pipe is drawn, in order to make it more ductile. Is rain water, running through lead goose-necks from a roof, with sheet lead round the chimney (as is usually the case), preferable to well water as a drink?"

It yet remains for some one to achieve fame and fortune and confer an incalculable amount of good upon the race, by inventing water supply-pipes which shall possess the following requisites: 1. Entire freedom from corrosion by any and all kinds of natural waters. 2. Exemption from the action of air and moisture and a moderate degree of heat. 3. Flexibility, strength, and ease of joining. 4. Cheapness. The nearest approach to this standard, at present, is the tin-lined pipe. The objections to the tin-lined pipes are: 1. Where joints are made, the tin and lead come in contact with the water, and then, owing to galvanic action, the corrosion of the lead is more rapid than if tin was not present. 2. The tin lining is liable to cracks and flaws, which allow the water to come in contact with the lead, with the same result as at the joints. 3. There are some waters that rapidly corrode the tin itself, when it is not in contact with lead or other metal. If, as this correspondent states, lead is mixed with the block tin to make it more ductile, this is still another and more serious objection. Gutta-percha will not withstand the action of air and moisture, and is consequently useless. Iron rusts, and if galvanized, the water dissolves the zinc coating. [Pure water oxidizes, but does not dissolve the oxide of zinc. The expression, water dissolves zinc coating is calculated to mislead. Galvanized iron pipes may be used with safety under proper circumstances, and when the water is free from free acids, alkalies, chlorine, etc.—EDS. SCIEN. AMERICAN.] The answer to the last question depends upon circumstances. If the well water is pure and soft, then it is preferable. If it is hard, choose the rain water, and filter it. If we adopt the rule not to use water which has stood or been long in contact with metal, we shall escape with slight injury.

The Hartford Steam Boiler Inspection and Insurance Company.

This company makes the following report of its inspections for the month of November:

During the month 510 visits of inspection have been made; 909 boilers examined, 822 externally and 144 internally; 57 have been tested by hydrostatic pressure. The number of defects in all discovered are 294, of which 57 are regarded as dangerous. These defects in detail are as follows: Furnaces out of shape, 20—4 dangerous; fractures in all, 19—6 dangerous; burned plates, 35—4 dangerous.

Mr. Fairbairn finds that the strength of iron plates diminishes one fourth at a red heat, and it is not difficult to understand that, at a very high heat, no reliance whatever could be placed upon iron when subjected to a strain; and although portions of the crown sheet from exploded boilers do not always indicate that they have been subjected to an injurious temperature, still this is true in some instances, and must be reckoned among the causes which operate to weaken steam boilers, and they are consequently in a condition inviting explosion.

Blistered plates, 51—2 dangerous; cases of incrustation and scale, 59—5 dangerous. Of cases of sediment and deposit several have been found, generally the result of exhausting into the heater. This difficulty has been especially true in certain cases where manufactured oils were used for lubricating the engine cylinders, and where there was considerable carbonate of lime in the water used in the boiler. Either use pure oils for lubricating or else run the exhaust somewhere besides into the well or tank from which the boilers are filled.

Cases of external corrosion, 52—7 dangerous; cases of internal grooving, 4; water gages out of order, 23—10 dangerous; blow-out apparatus out of order, 8—1 dangerous; safety valves overloaded, 15—4 dangerous; steam gages out of order, 15—3 dangerous; boilers without gages, 3; cases of deficiency of water, 6—1 dangerous; cases of insufficient or broken stays, 4—2 dangerous. One inspector reports that in one case nearly all the braces were broken from one boiler head, and another reports that in a boiler 5 feet in diameter, under heavy pressure, nearly all the braces in both ends were either broken or very loose. This difficulty may be set down as another cause of boiler explosions.

Force, and What It Is.

Professor Youmans, in a recent lecture delivered in Steinway Hall, in this city, om the "Dynamics of Life," stated some interesting facts. The lecturer pointed out the nature of force, showing that it was indestructible, although capable of change. Thus the force acting on the very center of the sun was never lost. It went forth in the form of light and heat; it raised up the plant; the plant was food for the ox; the ox was changed into muscle and nerve, which gave men power to strike the blow; the blow produced heat: so force was convertible. Force is never lost. By an easy transition, he passed to the storing up of force. He gave some remarkable instances of this storing, which is mechanical and molecular. Thus, one pound of coal has sufficient power in it to raise one pound of matter two thousand miles high. Then referring to a pail of water changed first into ice, then dissolved into water, which in turn was changed into steam, and subsequently separated into oxygen and hydrogen, he remarked that the force requisite to make these eight parts of oxygen and one of hydrogen into water was equal to the fall of one tun down a hight of five miles, the change of steam into water was represented by a fall of one tun 2,900 feet, of water into ice by a fall of one tun 433 feet. A knowledge of this fact caused Tyndall to observe that the force which a child carried in an apronful of snow was sufficient to hurl back an avalanche precipitated down a mountain side.

PRIZE ENGRAVING.—The first large batch of engravings was mailed or expressed to all parties entitled to them, on the 29th ult., the postage and expressage being in every case prepaid. We have now a sufficient number printed and put up in pasteboard covers to meet each day's demand, and orders will hereafter be filled on the day of their receipt.

Improved Music and Book Stand.

Many an invalid will welcome the improvement we herewith illustrate ; but while it is a desideratum for feeble folk, it will be found a luxury which few, either sick or well, having once enjoyed, will be willing to resign. While as a music stand it combines all the advantages required in such a piece of furniture, it enables reading to be performed without fatigue, while the person is placed in an easy reclining position.

Our artist has so well delineated the comfort it supplies, that little remains for us but to point out the distinguishing features of the invention.

A tripod with hollow stem receives the standard which supports the desk, and a set-screw enables this standard to be adjusted to any hight required. It may also be turned on its vertical axis and fixed by the set-screw as circumstances require, and this adjustment may be made without raising the person from a reclining position. A disk of wood or other suitable material supports the table of the stand, the latter being fastened to the disk by a central pivot with a thumb-nut on the under side. This gives another adjustment.

The disk which supports the table is hinged to the top of the standard at the rear portion and from the front descends an arc of a circle which passes through a slot in the standard where it is adjusted as desired by a set-screw.

These devices enable the desk to be set at any convenient angle to support a book for reading either while a person is sitting or reclining, so that the printed matter is placed directly in front of the eyes, and in such a position that no muscular effort is required to sustain the book or to keep the body in a position of constraint.

Still another great convenience is that the table may be adjusted in a level position and be used as an ordinary stand for medicines and other purposes desired.

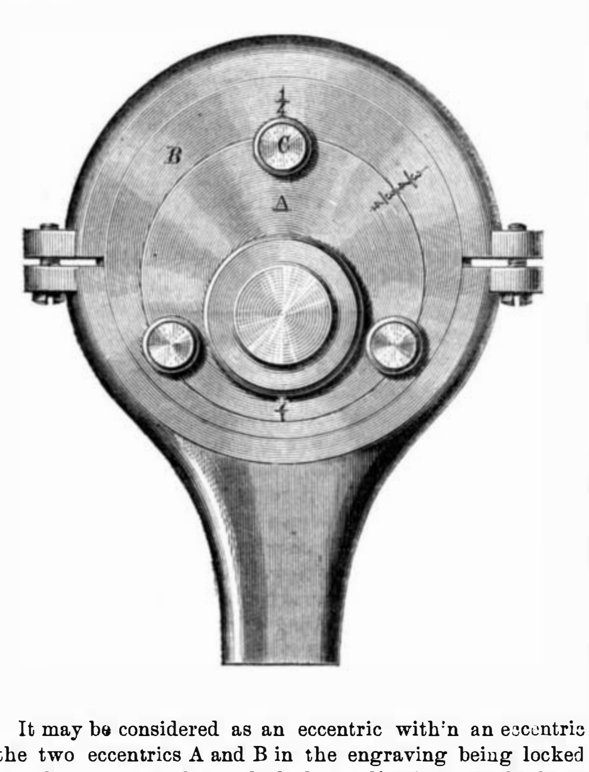
It admits of any degree of ornament deemed desirable, is easily constructed, and durable, and hence has all the qualities calculated to secure popularity.

This invention was patented Nov. 30, 1869, through the Scientific American Patent Agency, by Edward Conley, of Cincinnati, Ohio. Address patentee at 121 Main St., as above, for further information.

CONLEY'S MUSIC AND READING STAND.

WELLS' IMPROVED ECCENTRIC FOR STEAM ENGINES.

The object of this invention is to not only enable the ordinary adjustment for angular advance to be made, but also to permit a change at will of the length of the throw, and the travel of the valve by means of the eccentric, instead of effecting it through a link or any other device heretofore employed.



It may be considered as an eccentric within an eccentric the two eccentrics A and B in the engraving being locked together—except when unlocked for adjusting—by the bolts D C. These bolts are so placed that their heads, and the nuts opposite the heads, lap over the edges of both A and B, and when the nuts are screwed home the two parts are firmly locked together. These bolts also serve to keep the parts A and B parallel to each other.

The inner eccentric, A, being held to the shaft by a set screw, the greatest throw of the eccentric is obtained by turning the exterior eccentric or ring, B, until its widest part is in the position shown in the engraving, that is, upon the line of the greatest throw of the inner eccentric, A. The figures, ¼, marked upon both eccentrics, indicate by their coincidence when this adjustment is accurately made. When the narrowest part of B is brought into the line of the greatest throw of the inner eccentric, A, the minimum throw is obtained, and accuracy of adjustment is indicated by the coincidence of the figures ¼ on both pieces.

The whole forms a compound adjustable eccentric, which supplies a complete variable cut-off, and is very much simpler in construction than other devices hitherto adopted to secure the same end. With simplicity, increased durability and diminished cost are also secured. The device is free from elongated slots in the center, the effect of which is to weaken the parts, and it is adapted to use on shafts of uniform size throughout instead of being operated by a crank pin, as has heretofore been done in other devices made to secure the same end.

The improvement will attract the attention of engineers from its simplicity, and the advantages secured by it are obvious. Patented through the Scientific American Patent Agency, Sept. 21, 1869, by J. C. Wells, whom address for further information at Warren, Pa.

The Value of Mathematics.

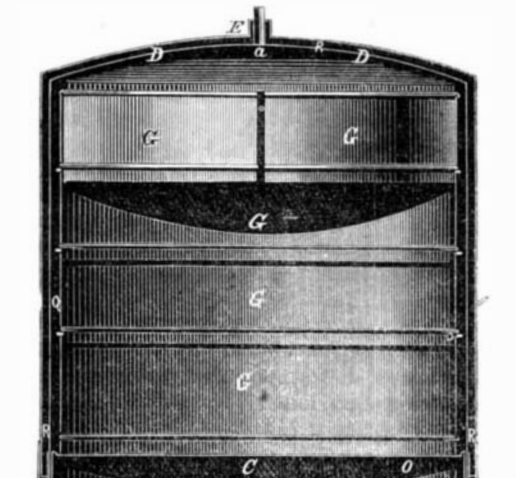
We do not recollect seeing an abler exposition of the value of mathematical study, and the use of mathematics as an instrument of investigation than the following extract from the tenth lecture of Mr. John Fiske, on the Positive Philosophy, delivered at Harvard :

"The logical utility of mathematics is not less obvious. The prevelent distaste for mathematics, coëxisting, as it does, in many persons with excellent reasoning powers, proves that the faculty of imagining abstract relations is ordinarily quite feebly developed. Not reason, but imagination, is at fault. The passage from premise to conclusion could easily be made, if the abstract relations of position or quantity which are involved could be accurately conceived and firmly held in the mind. Now the ability to imagine abstract relations is one of the most indispensable conditions of all precise thinking. No subject can be named, in the scientific investigation of which it is not imperatively needed ; but it can nowhere else be so thoroughly acquired as in the study of mathematics. But the excellence of mathematics as an instrument of mental discipline by no means ends here. It is, indeed, as Comte observes, a fallacy to suppose that greater certainty is attainable in geometry than elsewhere. Not greater certainty, but greater precision, is that which distinguishes the results obtained by mathematical deduction. Dealing always with definite or determinable magnitudes, its processes are characterized by quantitative exactness. It is not obliged to pare off and limit its conclusions, to make them tally with concrete facts ; but can treat of length as if there were no such thing as breadth, and of plane surfaces just as if solidity were unknown. It is thus the most perfect type of deductive reasoning ; and if logical training is to consist, not in repeating barbarous scholastic formulas, or mechanically tacking together empty majors and minors, but in acquiring dexterity in the use of trustworthy methods of advancing from the known to the unknown, then mathematical investigation must ever remain one of its most indispensable implements. Once inured to the habit of accurately imagining abstract relations, recognizing the true value of symbolic conceptions, and familiarized with the process of elimination as legitimately conducted, the mind is equipped for the study of quite other objects than lines and angles. The twin treatises of Adam Smith on social science, wherein, by deducing social phenomena first from the unchecked action of selfishness, and then from the unchecked action of sympathy, he arrives at mutually-limiting conclusions of transcendent practical importance, furnish a brilliant illustration of the value of mathematical methods and mathematical discipline.

"Bearing in mind these considerations, and recollecting also the extensive scope for inventive ingenuity afforded by the various devices by which algebraic expressions are utilized in the solution of physical problems, we may appreciate the emphatic statement of Sir John Herschel—a statement which he has thought sufficiently important to be printed in italics : 'Admission to the sanctuary of science, and to the privileges and feelings of a votary, is only to be gained by one means—sound and sufficient knowledge of mathematics, the great instrument of all exact inquiry, without which no man can ever make such advances in any of the higher departments of science as can entitle him to form an independent opinion on any subject of discussion within their range'."

SWEDISH COOKING APPLIANCES.

We illustrate on this page, from *Engineering*, one of a series of cooking utensils, recently patented in Sweden, and now being introduced into England. As will be seen in the engraving, the cooking stove consists of a sheet-iron base in the form of an inverted truncated cone, which supports an iron cylindrical vessel Upon the top of this is placed a nest of circular porcelain dishes, the one resting upon the other, and small recesses being cut at intervals around the base of each dish in order that there may be a free circulation of heat and steam. The nest of dishes is covered with a cylindrical casing of sheet iron, the lower edge of which fits upon the top of the iron vessel at the bottom before spoken of, and the whole is inclosed in an outer casing to prevent any radiation of heat. The apparatus stands upon a tripod, and occupies a very small area, the hight of the medium sizes not exceeding three feet, and the diameter being about ten inches. Either gas or oil may be employed for obtaining the necessary heat. If the former be found convenient a Bunsen burner is used, and the mixture of air and gas issues through a series of holes in the side of a circular burner, and is deflected so as to distribute the heat equally over the whole area of the vessel above. If, however, oil be employed, it is burnt in a lamp of peculiar construction with a flat wick bent in an annular form. In using the apparatus the circular iron vessel beneath the porcelain dishes is partially filled with water, and the material to be cooked being placed each in its compartment, the whole is inclosed in the inner and outer covers, and the heat being applied, steam is generated from the water, and circulates through the whole of the stove, until the food is ready. Besides the process of steaming, however, a dry heat can be obtained for roasting, baking bread, etc., by placing no water within the iron vessel.



In addition to this apparatus in its different forms, the conical base of the stove is adapted for coffeepots and other vessels required for ordinary operations on a small scale.

JET BLACK VARNISH FOR SHOES.—Dissolve 10 parts by weight of shellac and 5 of turpentine, in 40 of strong alcohol, in which fluid should be previously dissolved 1 part of extract of logwood, with some neutral chromate of potassa and sulphate of indigo. The varnish is to be kept in well-stoppered bottles.

JOHN CHINAMAN is a heavy purchaser of California produce Thousands of barrels of flour were sent to Hong Kong during November, and the latest advices by mail say there are many orders in San Francisco yet to be filled.