nervous sedative has caused such a demand that a supply of nearly 50,000 pounds per month is absorbed. Bromine, from which bromide and hydrobromic acid is made, is found in the "mother" or "bitter" water yielded by the salt wells of the Ohio valley at Pomeroy, O.; also the Kanawha and Monongahela valleys, tributary to the Ohio from West Virginia and Southwestern Pennsylvania. The two first named regions furnish the wells whose water is richest in bromine, and this element is almost entirely wanting in the salt waters of the Saginaw and Syracuse salt regions. The price of the article has, in the time stated, fallen to less than one-tenth that given above, and the demand for bromide shows a steady increase.

BOTANICAL NOTES.

Insectivorous Plants.—Last year attention was called in the *Cronica Cientifica* to the fact that Vayreda, in his work on the "Noteworthy Plants of Catalonia," had asserted that certain Spanish species of catch-fly (*Silene crassicaulis, S. aperta,* and *S. nutans*) possess the property of digesting the soft portions of the bodies of the insects that they capture by means of the viscid secretion which invests their stems. In a recent number of the *Cronica* Sig. Vayreda gives the results of certain experiments made by him on one of the above-named species last summer, for the purpose of verifying his original statement. He found that the viscid secretion on the internodes of the stem began to make its appearance about twelve or fifteen days before the flower buds opened. This secretion is transparent, colorless, and has a faint characteristic odor. Its viscidity is about the same as that of birdlime. It is partially soluble in water and almost entirely so in alcohol, and appears to be an oleo-resin mixed with a volatile oil. It produces a marked narcotic action on insects that come in contact with it. Sig. Vayreda having selected a number of plants of *Silene crassicaulis* of the same age, size, and vigor, dusted the viscid substance of some of them with plaster of Paris and covered that of others with cotton fibers so as to entirely prevent the access of insects to it; other plants he left in their natural state, and carefully watched the results in both cases. After numerous and attentive observations on the plants fed with insects and on those deprived of them, the author was obliged to confess that he could perceive no appreciable difference between them in development, dimensions, color, or physiological evolution, all having thriven equally well. When the seeds were mature, these were likewise compared microscopically and also weighed, but no difference could be distinguished between them. Sig. Vayreda hence draws the conclusion that while there is no doubt at all that the viscid secretion of *Silene* possesses the power of capturing and killing insects and of discoloring their bodies, its purpose is not to prepare nourishment for the plant, but rather to serve as a protection to the floral organs against unwelcome visitors; and, further, he believes that the secretions of other alleged insectivorous plants, such as *Drosera*, are provided for a like purpose. It would prove an interesting matter if some one, following Sig. Vayreda's example, should pursue a series of investigations on some of our American viscid species of *Silene*, the wild pink (*S. pennsylvanica*), for example, with a view of ascertaining whether the viscid secretion possesses the property of dissolving the soft portions of insects' bodies, and, if so, whether this proves of any special benefit to the plant.

Absorption and Diffusion of Heat by Leaves.—In a recent number of the *Annales Agronomiques*, M. Maguenne gives an account of an elaborate series of experiments undertaken by him with a view to ascertain the amount of heat absorbed by and radiated from leaves under given conditions. The author's paper is so long that we can merely give an abstract of his conclusions, which are as follows: "All leaves, it appears, diffuse a portion of the heat which they receive, more or less, according to the source of heat. Generally, but not universally, the lower surface gives off more heat than the upper. The absorption of the heat is due to the presence in the leaf of absorbent substances, such as water and chlorophyl. Thick leaves absorb more than thin ones; but the latter, however, transmit heat better than thick ones."

Changes in the Diameter of Trunks of Trees.—According to the *Gardener's Chronicle*, MM. Kraus and Kaiser have been making some researches, from which it appears that the trunks of trees undergo daily changes in diameter. From early morning to early afternoon there is a regular diminution till the minimum is reached, when the process is reversed and the maximum diameter attained at the time of twilight; then again comes a diminution, to be succeeded by an increase about dawn—an increase more marked than that in the evening. The variations in diameter coincide, therefore, with those of the tension, but they are shown to be inverse to the temperature, the maximum of the one corresponding roughly to the minimum of the other, and so on.

Action of Anæsthetics on Plants.—Claude Bernard has shown, says the *Lancet*, that the vapor of chloroform and of ordinary ether hinder the germination of seeds, and M. Rabuteau has found that this is equally true of bromide of ethyl and bromide of amyl. He finds, also, that all the ethers have the same effect. The experiments were made with grass seeds; but the property of germination is merely restrained. Seeds kept thirty-seven days exposed to the vapor of bromide of ethyl or bromide of amyl germinated, when placed under proper conditions, in two days. The question then presents itself: Have these substances a similar action upon plants which are in full progress of growth? Growing cress was exposed for two hours to an atmosphere saturated with vapor of bromide of ethyl. It then appeared feeble, the leaves hanging down, and it continued in this condition for a day or two, and then revived, but exhibited considerable retardation in its growth compared with other plants of the same age. The leaves of heliotrope become brown, and die in the course of two hours. Acetate of ethyl is somewhat less powerful. Cress lives after it has been exposed to the vapor for three hours, but does not survive an exposure of six hours. Heliotropes are only killed by an exposure of three or four hours. The action of acetate of ethyl is also correspondingly less active on animals.

A Western Oil Flood.

O. P. Yelton, now in Laramie City, Wyoming Territory, has kindly sent the *Era* a copy of the last issue of the weekly *Boomerang*, published in that city, from which the following article is taken:

"We have frequently spoken of the extensive oil wells now being worked by the Rocky Mountain Oil Company, in Sweetwater County, but the facilities for obtaining particulars have been so few that our people are not fully aware of how much is really being done toward developing so rich a deposit as is known to exist there. The company referred to is composed of Omaha capitalists, with Dr. Graff at its head. For the past month he has been superintending the work at the wells in person, and a report of a lengthy interview, on his return to Omaha the other day, appears in the *Herald*.

"Last season the company bored in several places, and collected the oil at other spots where it exuded from the ground, and built six or seven reservoirs to contain it. They stored two or three thousand barrels, but were fated to lose a part of it through an unforeseen casualty. About two weeks ago an ice gorge formed in Popajie Creek, above two reservoirs which held an aggregate of 1,200 barrels. The water poured over and into the reservoirs, and being heavier than the oil displaced it wholly.

"The sea of oil ran over the meadows for several miles about, blackening them as if a prairie fire had swept across. The farmers were incensed, but it was such a loss as the insurance companies would have classed under the heading of 'Acts of God,' and no one charged with fault. Since the gorge passed out the water is being pumped from the wells, which will soon fill to the brim again.

"The company can store from 1,000 to 1,500 barrels of oil a day, when they desire, and can dispose of it, and have reason to believe that theirs is an oil interest larger than that of the whole of Pennsylvania and far easier developed. The president of the company guarantees that they can produce 50,000 barrels per day when they require it.

"The value of Wyoming oil has already been tested. In its crude state, without the least refining or treatment, it serves as an excellent lubricating oil, and the Union Pacific engines are using it. This summer the oil company propose to erect a refinery alongside the Union Pacific railway track, where they will refine it for illuminating purposes, making an excellent head-light oil. Dr. Graff has been out to see about building a direct wagon road from the wells to the railroad, instead of following the present roundabout way, the length of the former being seventy-six miles. He was driven back by the winter, the season being too little advanced. Dr. Graff is looking forward to the time when these wells shall supply all the country west of the Missouri."—*Bradford Era.*

Venus and Mercury at Noon-Day.

We had a superb telescopic view of these two planets a few days since nearly at the time when the sun passed the meridian. We first took a peep at our brilliant neighbor Venus with the naked eye, for she may be seen any clear day in the bright sunshine, if one knows where to look. A pin-head of filmy cloud or a dot of molten silver was the modest form assumed by our sister planet in the sun's majestic presence, as after looking intently, she suddenly came into view from the depths of the blue sky. The telescope was then turned toward her, and the cloudy speck was transformed into a charming crescent as large as the moon. The color was pale gold, and the crescent as slender as the waning moon two or three days before her change. The terminator or line between the light and dark portions of the disk was slightly irregular, so that, though twenty-three million miles distant, we were actually seeing the summits of the mountains on Venus illumined by the sun. The crescent Venus comes next to Saturn and Jupiter as an object of telescopic interest.

Mercury was the next subject for observation, and the shy planet, difficult to find even when the sun is below the horizon, quickly made his appearance under the magic spell of the glass. He did not take on a grand aspect, for he is far away and comparatively small in size, but he looked much as Venus now looks to the naked eye, perhaps not quite as large and far less brilliant. He had, however, a distinctly gibbous phase, like the moon after she has passed her first quarter, for both Mercury and Venus, revolving within the orbit of the earth and being nearer the sun, pass through all the phases of the moon during their course, as seen by terrestrial observers

Only a short time remains in which Venus may be studied in her present phase, for she is rapidly approaching the sun, and will soon be hidden in his light. A good spy-glass will show the crescent form of this bewitching planet. This was all the help that Galileo had, and with its aid he was the first observer who beheld the crescent phase. A good opera glass will accomplish the feat with sharp-sighted observers. A few instances are on record where the crescent has been seen with the naked eye, but this, like detecting the moons of Jupiter, is an exceptional visual gift, which ordinary stargazers may not hope to enjoy.—*Providence (R. I.) Journal.*

Product of an Iowa Creamery.

The *Farmer's Review* prints the following table showing the amounts of milk received each month last year by an Iowa creamery, with the amount of butter made therefrom, and the percentage of the yield. The average for the twelve months was 4⅛ pounds of butter for each 100 pounds of milk. During six months the milk was received twice a day, the rest of the year but once a day. It was set in cooling cans, in water at a temperature of from 50° to 55° Fah.

	No. of lb. milk.	Lb. of butter.	Yield per 100 lb.
January	50,193	2,225	4·23
February	47,643	2,003	4·20
March	66,986	2,779	4·00
April	98,691	3,795	3·74
May	194,166	8,069	4·15
June	245,047	9,695	4·07
July	244,973	9,977	4·07
August	215,177	8,371	3·90
September	200,437	8,923	4·44
October	169,195	6,793	4·01
November	110,383	4,737	4·29
December	77,597	3,434	4·42

The Second Bridge Between New York and Brooklyn.

The bridge from New York to Brooklyn, crossing Blackwell's Island, is under contract, and the contractors are now busy on the iron work of the pier foundations. The estimated cost of the bridge is $5,000,000; the time fixed for its completion is three years. There will be four piers, one at Ravenswood, another at the coal dock on Blackwell's Island, a third on the west side of the island, and the fourth on the New York side, between Seventy-sixth and Seventy-seventh streets. It is intended that the New York approach shall form a junction with the railroads in the Fourth avenue tunnel, a mile and a quarter above the Grand Central Depot, and that the Long Island approach shall connect with a spur of the Long Island Railroad. The bridge will be 74 feet wide, and will be arranged for two sidewalks, two carriage-ways, and two steam railroad tracks. The span over the water from Ravenswood to Blackwell's Island will be 618 feet, that across the island 700 feet, and that over the river to New York 734 feet. Each pier will rest on bed rock, the dip of whose strata at all points is nearly vertical. The Ravenswood pier only will stand in the water, and a coffer dam will be placed in position next week to prepare the rock for its reception. One corner only of the New York pier will touch the water. The roadway will be 154 feet above the river at high tide, and 160 feet at low tide. A commission to appraise the land needed on Blackwell's Island has been appointed by the Supreme Court.

Cutting Holes in Glass.

The operation of making holes and sections in glass and porcelain is often a troublesome and unsatisfactory one. The firm of Richter & Co., in Chemnitz, have found a way of so impregnating thin German silver disks (15 to 25 mm. diameter) with diamond, that when fitted to a quickly rotating tool, these cut through glass or porcelain in a few seconds, or effect any desired carving with great accuracy. With cylinders made on the same principle, round holes can be quickly and exactly made. The wear of the implement, even after much use, is hardly perceptible.

Lack of Air.

Some workmen think themselves "tired" when they are only poisoned. They labor in factories, breathe air without oxygen, and live in an atmosphere of death. They are, too often, allowed to smoke, and thus add fuel to the flame which is consuming them. They knock off work "tired" and listless, when they are merely weakened by foul air and made dull and heavy by an atmosphere charged with disease. They keep the windows shut and close the door on health, while they lift the gratings of the tomb by breathing and re-breathing the poison from their own lungs, and the floating particles of matter about them. Open the windows—let in the sunshine and the breeze, stop smoking, and you will soon find that it is the poison of confinement, and not labor, that wearies and tires.—*Montreal Herald and Star.*

Magic Mirrors.

The magic mirrors, which have been a good deal discussed of late, are all of metal. M. Laurent has succeeded in making them of glass, which is sufficiently elastic for the purpose. At first he used pressed glass, polishing the surface opposite to the projections; then he tried the thin glass of commerce, engraving a hollow design. The two methods may be combined. When at rest the mirror is plane, and gives good images. By a blowing or sucking action the characteristic features are brought out. Both sides of the mirror are silvered.

Maple Sugar.

From two groves of maples in North Harpersfield, Delaware County, New York, the yield this year has been seven tons of maple sugar. The groves contain 4,200 trees. In 1875 the town of Harpersfield produced 200,000 pounds of sugar, an amount which this year's crop is thought to exceed.

A New Alkalimetric Indicator.

BY H. W. LANGBECK.

Nitro-phenic acid dissolved in 100,000 parts of distilled water presents a nearly colorless liquid, but if a trace only of an alkali be added a distinct yellow color appears. This delicate indicator is, of course, only useful if colorless or slightly colored fluids are to be examined. In determining, for instance, the temporary hardness of water, I dissolve 1 part of nitro-phenic acid in 5,000 parts of distilled water; I also prepare centinormal potash and acetic acid solutions. 100 c. c. of distilled water are put into one Nessler glass, the same quantity into another, and again 100 c. c. of the water to be examined into a third. To each of them 5 c. c. of nitro-phenic acid solution are added (one is kept for comparing), which leaves the distilled water nearly colorless, while the common water turns yellow to deep yellow according to hardness. From a burette centinormal potash solution is then added to the one glass of distilled water until the color is of the same shade as the common water; each c. c. used is equal to 0·00028 of lime, CaO. To verify the result, centinormal acetic acid is added until the first shade (nearly colorless) returns; the quantity of acid required is, of course, the same as the alkali. The common water is now also treated with the centinormal acid until the first shade is reached; each c. c. used equals 0·0005 of carbonate of lime. I compared, for instance, 100 c. c. of distilled water with 100 c. c. of water of the East London Company. The distilled water required 1·9 centinormal potash solution to color it the same shade as the common water, and also 1·9 c. c. of acid to become nearly colorless again; the water in question contained, therefore, 0·532 lime (CaO) in 100,000 parts. The common water required 29·8 c. c. to return to the first shade. From this quantity 1·9 = lime found must be deducted. Each of the remaining c. c. is equal to 0·0005 carbonate of lime, = 13·95 in 100,000 parts, or total temporary hardness = 14·482.—*Chem. News.*

Judgment and Forethought in the Education of Children.

In a very thoughtful and suggestive inquiry as to the reasons why "promising" children so seldom turn out as parents and friends anticipate, the Philadelphia *Public Ledger* discovers a potent cause of failure in the man which parents will find worthy of serious consideration. After speaking of the more familiar ways of spoiling children by unwise management or improper training, the *Ledger* says:

The truth is, we need more forethought and less self-indulgence in the training of our youth. We please ourselves too much, and study their future too little. It is so easy and pleasant to gratify our own vanity or ambition by stimulating and exhibiting them in points where they excel; it is so hard and comparatively tame to exercise them in what they are deficient, and to foster their most meager abilities. Yet until educators acquire the necessary self-control and patience to do the latter; until they can work quietly and steadfastly without display, and fix their aim on future results instead of present glitter, the most promising children will continue to sink down into inferior men and women.

The qualities that are the most attractive in childhood are not by any means the most valuable in maturity. We look for determination, will, decision of character, firmness in the man, and refuse him our respect if he have them not. But when the child exhibits these qualities, even in their incipient stages, we are annoyed, and, perhaps, repulsed. Instead of rejoicing in his strength of will and guiding it into right channels, we lament it as a grievous fault in him and a misfortune to us. It is the meek and yielding child who cares not to decide anything for himself, in whom we delight, and whose feeble will we make still feebler by denying it all exercise. Yet, when he grows up and enters the world and yields to temptation, and, perhaps, disgraces himself and his family, we look at him in imbecile wonder that so *good* a child should have turned out to be so bad a man, when, in truth, his course has only been the natural outcome of his past life and training. The power of standing firm and going alone we know to be desirable in the adult, but the child seems more lovable who is utterly dependent upon us, and we therefore strive to cherish this dependence, shutting our eyes to the fact that we are thus actually unfitting him for the life that awaits him. Concentration, too, is a quality that we admire in the adult, but greatly undervalue in the child. We prefer that he may be easily drawn away from what he is engaged in, and quickly turned from one thing to another at our pleasure; and while we praise him for his ready obedience, or rebuke him for seeming absorbed, we are really breaking down the power of concentration, and depriving him of its invaluable results.

It is true that many things are suitable for manhood that are not for childhood, but this is not the case with mental and moral qualities. If it were there could be no such thing as consistent preparation for a good and useful life. Every quality that the man or woman needs is incipient in the child, and needs development and exercise. Our part in his training is not to cherish in him simply what is most attractive to ourselves, or what feeds our own and his vanity, but rather to study his future needs, and to help him to supply what is most lacking. It is where he is deficient, not where he excels, that our earnest efforts are demanded. Not until parents and teachers realize this so fully as to identify with it their highest interest and pleasure in their charges, will promising children fulfill their promises, and the question no longer be asked, "What has become of them?"

Paper Pulp from Wood.

The following is a description of the process of making wood pulp: The wood, four feet in length, and of any thickness, is brought in at the basement of the manufactory, placed in the barking jack (one stick at a time), where two men with draw-knives rapidly peel off the bark. It is then conveyed by an elevator to the first floor, sawed in two-foot lengths with crosscut saws, and passed on to the rip-saw, where it is slabbed (that is, a small portion of wood on opposite sides taken off), to permit it resting firmly in the grinding engine. It is then passed to the boring machine (an upright 1½ inch auger, with foot attachment, driven by power), where the knots are bored out. The wood is then placed in racks of the same size as the receptacle in the grinding engine, and carried out to be ground. The grinding engines are upright, and receive at a filling one-twentieth of a cord of wood. The wood is placed in a receptacle, and by a simple, variable, automatic feed process, is pressed flatwise between two outward revolving rolls, composed of solid emery, which are flooded with a spray of water, carrying off the fibrilized pulp in a stream through revolving screens to the tank or stuff-chest in the basement. It is then pumped up into a vat that forms part of the wet machine. In this vat is constantly revolving a large cylinder faced with fine brass wire-cloth, which picks up the particles of pulp out of the water and places them on the felt (an endless piece of woolen goods which makes between rolls, for different purposes, a continual circuit of the wet machine). On the cylinder is turned a heavy roll, called the "couch;" between the two, where they meet, the cylinder leaves the pulp, with most of the water pressed from it. The pulp now makes its appearance on the felt above the concha roll in a beautiful sheet, 38 inches in width, and is carried along in a steady flow a distance of about 8 feet, where it passes between (the water here again being pressed from it) but not beyond two heavy rollers, the upper one iron, the lower one wood; it adheres to the upper roll, which is constantly turning, wrapping it up, and when a sufficient thickness is attained, is cut off by a knife being pressed to the roll, which is attached to the machine for that purpose. It now leaves the roll in a thick white sheet, 36x38 inches, which is received by a boy in attendance on a table conveniently attached to the machine, and folded into a sheet 14x26 inches. It is then placed on scales until the weight is 100 pounds, when it is placed in a press and firmly tied into square, compact bundles. It is now ready for shipment to the paper mill.

Adventure in the Cave of Cacahuamilpa.

A serious but fortunately not fatal termination came to a recent excursion from the City of Mexico to the Cave of Cacahuamilpa, in honor of some American visitors. About fifty persons left Mexico, but the party received so many accessions by the way that when the cave was reached there were as many as 500 persons in the company, including the military guard.

It appears that Señor Carlos Quaglia, Governor of Morelos, had ordered a banquet to be prepared in that portion of the grotto which bears the name of "The Organ Salon," on account of the stalactites which have there assumed the form of an organ. The place was illuminated by electric lights, yet there were also many torches of resinous wood burning. The *élite*, who numbered perhaps ninety persons (there were also a great many servants), occupied the Organ Salon. In close proximity were placed several shelter tents for the ladies and children to sleep in. These were filled with sleepers, and along one side of the banqueting hall many gentlemen were lying on mattresses, mats, or blankets. A few of the more animated guests lingered over the table until 2 o'clock in the morning, and were chatting, when Governor Quaglia fainted. All efforts to restore him to consciousness seemed futile. While he remained in this condition some ladies complained of illness, others were asphyxiated, and a gentleman suggested that all this might be due to mephitic exhalations. Mothers at once hastened to their children, and, finding some in a stupor, comprehended the danger. A panic ensued. General Diaz ordered an instant retreat from the grotto. General Ord and others instructed the soldiers to carry out the ladies and children. Ex-Governor Romero Vargas aided Señor Mariscal, Minister of Foreign Relations, to scramble over the rocks. In fact, all who had strength assisted those who were asphyxiated, and every person was removed to a purer atmosphere. Some persevered until they reached the entrance of the cave (three miles distant) and threw themselves down on the bare ground, almost exhausted with fatigue, but safe.

George Stephenson.

At an influential meeting lately held in the Town Hall, Newcastle-on-Tyne, the following resolutions were carried unanimously:

"That this meeting is of opinion that it is desirable to commemorate the centenary of the birth of the late George Stephenson on the 9th of June next, and expresses the view that Newcastle-on-Tyne, being practically the place of his nativity, and where his first and most important engineering triumphs were won, is the most fitting center where such celebrations should be held.

"That this meeting is of opinion that there is no better way of doing honor to the name of Stephenson and perpetuating his memory in this district than by erecting a building for the use of the University of Durham College of Physical Science, to be called the Stephenson College."

A Yellow Crow Lost in the Mails.

A white crow is a rare bird, but a yellow one is rarer still, and yet a bird of this color has been lost in the United States mails, that general receptacle for all sorts of merchandise to be transported over the country. One of Uncle Sam's officers in this far Western country, while perambulating the Rocky Mountain region (in the southern part of Colorado) came upon a rare bird, a yellow crow, which he succeeded in capturing. The bird was carefully skinned, the skin thoroughly cured and prepared for shipment to the Smithsonian Institution, at Washington. There being no way save the mails for shipping such articles from the wilds of La Plata County, this rare and valuable specimen of ornithology was intrusted to the care of the Post Office Department, and there the story ends for the present. The yellow crow still remains unknown, except to the very few who saw the bird before shipment, but earnest and determined efforts are being made to find the lost specimen, and Gen. Cameron, the Post Office Inspector for this division, to whom the case has been intrusted, expresses a determination to find the missing bird, unless the same has been stolen outright by some dishonest official.—*Denver News.*

Automatic Recording of Telephone Messages.

In a book on the application of the telephone and microphone to physiological and chemical uses, Dr. Boudet describes his method of automatic recording of telephone messages. To do this he removes the diaphragm of the Bell telephone, screws to the wood one end of a steel spring, the other end being opposite the pole of the magnet. To the free end he solders a small piece of soft iron, weighing one-tenth of a gramme. Attached to this piece, and in the prolongation of the axis of the spring, he fixes a light bamboo arm, ten centimeters long, and terminated by a needle of whalebone. In fact, the diaphragm is replaced by a movable armature resembling the interrupter of an induction coil. The tracings are made on smoked paper, and transferred to glass. There are some points of difference, as well as resemblance, which make it probable that tracings of this kind may be deciphered, but the matter is in embryo yet.

Imperfect Eyes among School Children.

Three years ago the Philadelphia Medical Society appointed a committee to investigate the condition of the eyes of the children in the city schools. The report of the committee was read by the chairman, Dr. Risley, at a recent meeting of the society. The committee had examined about 2,000 pairs of eyes. The condition of those examined, Dr. Risley said, had proved better than had been expected by the committee. The cases of impaired sight ranged from 25 per cent among the smaller children to 40 per cent among the older scholars. The average of diseased eyes ranged correspondingly from 30 to 60 per cent. The instances where any blame attached to the Board of Education or their sectional boards for want of care for the eyes of the children were only two, one of which was the case of the primary practicing class in the Normal School. The room is lighted by one large western window, which, owing to the position of the desks and the master's table, the children are obliged to face.

Fusion of Metals by Electricity.

M. Imbert describes Siemens' method of fusing large metallic masses by means of electricity. He uses a plumbago crucible, surrounded by a thick refractory wall, the cover being traversed by a carbon rod of 20 millimeters (0·79 inch) diameter. This rod is suspended by one of the arms of a balance beam, the other arm carrying a cylinder of soft iron sliding freely in a solenoid and plunging into a liquid, in order to moderate the oscillations which might arise from sudden variations of current. In one experiment 500 grammes (1·102 pounds) were melted into a compact ingot in four and one-half minutes. In melting large quantities the electrical method is rather more than twice as costly as the ordinary furnace, but for the fusion of precious or refractory metals, for chemical purposes, and for other applications where the question of economy is secondary, the new method is very convenient and practical. In melting small quantities it may even prove economical.—*Ann. du Gen. Civ.*

Excess of Fat.

Dr. George Johnson's diet for excess of fat: The patient *may eat:* lean mutton and beef; veal; lamb; tongue; sweetbread; soups, not thickened; beef tea and broths; poultry; game; fish; cheese; eggs; bread, *in moderation;* greens; spinach; watercress; mustard and cress; lettuce; asparagus; celery; radishes; French beans; green peas; Brussels sprouts; cabbage; cauliflower; onions; broccoli; sea-kale; jellies, flavored but no sweetened; fresh fruit in moderation, without sugar or cream; pickles.

May not eat: Fat bacon and ham; fat of meat; butter; cream; sugar; potatoes; carrots; parsnips; beet root; rice; arrowroot; sago; tapioca; macaroni; vermicelli; semolina; custard; pastry and pudding of all kinds; sweet cakes.

May drink: Tea; coffee; cocoa from nibs, with milk, but without cream or sugar, dry wines of any kind, in moderation; brandy, whisky, or gin, in moderation, without sugar; light bitter beer; Apollinaris water; soda water; seltzer water.

May not drink: Milk, except sparingly; porter and stout; sweet ales; sweet wines. As a rule, alcoholic liquors should be taken very sparingly, and never without food.

Express Atlantic Steamers.

A company is being formed, with a nominal capital of two and a half millions, to work a line of express steamers between Milford Haven and New York. Although certain statements have been made concerning the proposed dimensions of these ships, we may say at once that nothing has been settled concerning this point; the size of the company's steamers is still an open question. The idea is that they will be about 550 feet long, 45 feet beam, and that they will draw about 25 feet when loaded; but these figures must be taken as approximate, as well as the statement that they will carry 5,000 tons of goods and 400 first-class passengers.

Only one point has really been settled, or can at present be settled, but it forms the pivot round which all or nearly all other questions connected with the new ships and their construction must turn. This is their speed, which is to be 20 knots, or about 23 miles an hour. No such speed has ever been attained by any screw steamer of large size; and it has only been reached by a very few paddlewheel yachts on rare occasions. The first ship driven at this speed across the Atlantic will have performed a feat without, for the time, a parallel; and when we bear in mind in what a rapid ratio the resistance of a ship increases with each augmentation of speed, it will be seen that the construction of the proposed express Atlantic steamers presents a tremendous problem for solution to naval architects and engineers.

Calculations have been made, which appear to be accurate, and they go to show that 16,000 indicated horse power, and probably more, will be required to drive a ship of the stated dimensions at 20 knots an hour across the Atlantic. It is very doubtful if the required velocity could be got at all with a vessel with much less than 7,000 or 8,000 tons displacement.

It will be understood that the conditions of the problem are very different from those affecting the design of a torpedo boat. The latter can only attain a high velocity in comparatively still water; but these great Atlantic liners must be driven at full speed through head seas; and sheer dead weight and great length must be present in them to enable them to preserve their way steadily, instead of being constantly checked and beaten off their course by the waves. If large dead weight and great length are necessary, it follows that the engine power must be in proportion; and for these reasons the idea that a small steamer of little power may be made to attain a high speed in a sea like the Atlantic, is well understood by all naval architects and engineers to be futile.

We may thus consider it as certain that engines exerting 16,000 horse power at least will be a necessity in the proposed ships. We have said that these vessels will draw only about 25 feet. They cannot be fitted with propellers of more than about 22 feet or 23 feet in diameter; and it is a very grave question if anything like 16,000 horse power can be sent through such a propeller without great loss. The shallow draught has been adopted no doubt for good reasons, and it may be taken that a propeller of greater diameter than we have stated cannot be used.

Let us suppose, however, for the moment that 16,000 horse power can be sent with economy through a single propeller, and we are face to face at once with the question, Where is a crank shaft to be had which can transmit this power when revolving at a moderate speed?

Making every allowance for the skill of modern smiths, we cannot help regarding it as somewhat doubtful that a trustworthy shaft of the kind can be made. Allowing that steel is to be used, and that the shaft will be built up on the most approved principles, we shall find that many portions of it cannot be less than 2 feet 6 inches in diameter by about 7 feet long. Sound forgings of these dimensions have never yet been produced. The weight of such a block would be when finished nearly 8 tons. It is true that heavier forgings have been made for years, but they have not been solid. We do not assert that a sound crank shaft, with a minimum diameter at any place of 2 feet 6 inches, cannot be made; but we do say that no such shaft has yet been made, and that it will not be easy to produce one. Such a shaft might, perhaps, be depended upon to transmit power safely at the rate of 250 horses indicated per revolution per minute. This means 64 turns per minute to provide for 16,000 horse power, and this velocity implies a great deal more than appears at first sight. If the engines are to be kept down to reasonable dimensions they cannot well have a stroke of less than 6 feet, corresponding to a piston speed of 768 feet per minute.

Considering the enormous dimensions of the masses to be moved at this velocity, it is evident that unusual precautions will have to be taken in arranging the lead and in balancing the engines. Apparently the only type of engine that can be used is that of the Britannic, repeated and modified for the better, either on the system designed by Mr. W. Allen, of Sunderland, for the City of New York; or by Mr. Humphries, of Barrow-in-Furness, for the City of Rome. That is to say, the engines must have at least six cylinders—the three high pressure above the three low pressure, and the main shaft fitted with cranks arranged at 120°.

But the engines of the City of Rome, to indicate 10,000 horse power as a maximum, are probably about as large as engines of the type can be conveniently made; and consequently, unless the builders of the engines of the new steamers are prepared to use cylinders of much greater diameter than those of the City of Rome—namely, 43 inch and 86 inch—eight cylinders, or four engines, will be required. More would be necessary, but the velocity we have named, 64 revolutions per minute, is greater than that of the City of Rome's engines by some 14 or 15 per cent. With six cylinders of 55 inch and 110 inch we think the requisite power might be got, but the strain on the crank shaft would be proportionately augmented. The crank shaft of the City of Rome is built up of hollow forgings of fluid compressed steel; it is 25 inches in diameter, or but 5 inches smaller than the dimensions which we have named as the least possible for those of the proposed boats.

No matter what point of view we regard the problem from, it will be found fraught with doubt and trouble, and we still hesitate to say that a trustworthy shaft can be made to transmit 16,000 horse power at 64 revolutions per minute. It is questionable, however, if this speed will suffice. Making a small allowance for slip, the screw must have a pitch of at least 36 feet, which is fully sharp for a diameter of about 23 feet; a higher velocity would give a lighter engine, a smaller crank shaft, and a better screw. But on the other hand, is it certain that colossal machinery of this kind can be made to work at a much higher speed than 64 revolutions per minute with ease and safety for a week at a time? The experience to be had in men-of-war is of no use whatever in this connection. It is one thing for engines to make a six hours' full power trial, and another to run at full power for a week at a time in all weathers, and to do this month after month without accident or heavy repairs.

All that we have said seems to indicate the use of twin screws instead of a single screw. In this way we should have two 8,000 horse power engines instead of one of 16,000 horse power; but, tempting as the advantages are thus held out by the twin screw system, we hesitate to say they are worth having at the price to be paid for them. Indeed, it is more than doubtful if it be possible to obtain under any circumstances 20 knots with twin screws. They give handiness, no doubt, and they render the use of comparatively light machinery compatible with the development of great power; but none of the great ocean companies have adopted them, and there are objections to their use which are, we think, insuperable.

All things considered, we think engineers will find it more easy to get a sound crank shaft of the required size, than to drive a ship at 20 knots with twin screws. Whether 16,000 horse power can or cannot be used up by single four-bladed propellers, 23 feet in diameter and 35 feet or 36 feet pitch, remains to be seen. Assuming that 50 per cent of the whole power developed is, as is usual in screw ships, wasted, the screw would still exert a thrust of not less than 130,000 pounds, or over 58 tons. It is not easy to see how so enormous a thrust can be got out of so small a propeller. It would be very mortifying if, after the ships were finished, it was found that their screws were quite inadequate to utilize the power of the gigantic machinery which turned them round.—*The Engineer.*

The Coming Bleach.

When Thenard succeeded in adding another equivalent of oxygen to water, converting H_2O into H_2O_2, he had made one of the most brilliant of modern discoveries. Sixty-three years have passed since that event, yet oxygenated water, peroxide of hydrogen, hydrogen dioxide, as the compound has been successively called, is still regarded as one of the most remarkable products of chemistry. Resembling water in its freedom from color and odor, and mingling with it in all proportions, it is distinguished from that liquid by its sirupy consistency and by its higher specific gravity (1·452). When pure it begins to undergo decomposition at 70° Fah., giving off bubbles of oxygen and being converted into water. This change is quickened by the addition of an alkali, and retarded by that of an acid. When dissolved in water it is much more stable, and its aqueous solutions are prepared and sold for medicinal and photographic purposes.

For the preparation of hydrogen dioxide, baryta is still found indispensable, and a clearer conception of the process and its probable cost will be gained if we remember what is the source and what are the properties of baryta. This substance occurs as the sulphate, called heavy spar, in various parts of the United States, notably at Hopewell, New Jersey, on the line of the Bound Brook Railroad, about 30 miles from Philadelphia. When pulverized, mingled with powdered charcoal, and strongly heated, the sulphate of barium becomes the sulphide, and if this be treated with hydrochloric acid and water added, we have a solution of barium chloride. By decanting this and adding a solution of an alkaline carbonate, barium carbonate is precipitated, and if we collect the precipitate and calcine it in a crucible, the oxide of barium—baryta—BaO, results. Now this oxide, when placed in a tube, heated to dull redness, and subjected to a current of atmospheric air, takes up another portion of oxygen, becoming that interesting substance, barium dioxide or peroxide of barium, BaO_2, which, as some of our readers will recall, was brought into use by Tessie du Motay for bleaching silk, feathers, etc., and which is rapidly growing in practical importance.

Powdered barium dioxide, made into a paste with water and put by portions at a time into cold and dilute hydrochloric acid, dissolves without disengagement of gas, yielding barium chloride and hydrogen dioxide. The changes may be thus expressed:

Barium dioxide.		Hydrochloric acid.		Barium chloride.		Hydrogen dioxide.
BaO_2	+	$2HCl$	=	$BaCl_2$	+	H_2O_2

The barium chloride and hydrogen dioxide both remain in solution, and to separate the barium it is precipitated in the form of the sulphate by the careful addition of dilute sulphuric acid, agreeably to the following equation:

Barium chloride.		Sulphuric acid.		Barium sulphate.		Hydrochloric acid.
$BaCl_2$	+	H_2SO_4	=	$BaSO_4$	+	$2HCl$

The hydrochloric acid thus reproduced now admits of more barium dioxide being added, and the operation may be many times repeated if the vessels are kept cool. If the hydrogen dioxide be required pure and concentrated, the remaining barium chloride is precipitated by sulphate of silver, the solution poured off, and evaporated *in vacuo.* The concentrated hydrogen dioxide is not demanded for industrial purposes. Solutions containing 3·04 per cent by weight suffice for the English market. They are called ten-volume solutions, because 1 cubic inch evolves 10 cubic inches of oxygen when fully decomposed. Twenty-volume and thirty-volume solutions are made in England to order.

It is said that when the Empress Eugenie, who was a blonde, led the fashion, certain dark-haired belles of Paris, anxious to emulate her even in the color of her hair, had theirs bleached to the "golden" tint, by a hairdresser of that city, who employed for the purpose hydrogen dioxide. In London it is used for a like object on dark false hair, which is saturated with a ten-volume solution and then exposed for two or three days, when the oxygen is liberated and the lighter shades are obtained. Hydrogen dioxide effectually bleaches blood serum in one of the processes for obtaining colorless blood albumen. It is also used for cleaning and bleaching oil paintings and engravings, and for bleaching oil, wax, and ivory, especially the last. Of this, the inferior qualities used in Sheffield for knife handles are put first into a solution of sodic carbonate to remove the grease and open the pores; then washed and immersed in a solution of crude hydrogen dioxide containing about 2·9 per cent, to which one-eighth part of strong aqua ammoniæ had been added. This is kept in a warm place for two or three days, when the handles are removed and slowly dried in the air. The deep color is thus removed, and a beautiful pearly-white ivory, when polished, is the result.

The action of hydrogen dioxide in bleaching is to destroy the color directly by oxidizing it, and this, without the introduction of any foreign body into the vat, an action altogether different from that of the principal bleaching agents, sulphurous acid and chlorine. The former does not destroy the coloring matter, it merely combines with it to form a colorless compound which is prone to undergo decomposition and therefore to return to the original color. Chlorine acts only in the presence of water, from which it takes the hydrogen to form hydrochloric acid, leaving the oxygen thus liberated to do the bleaching.

That hydrogen dioxide, either under a true or false name, is employed in the bleaching processes of print works, and that its cost alone prevents its general introduction, there is no doubt. Anticipating its extended use, and recognizing its unrivaled advantages, the *Société Industrielle de Rouen* offers a prize open to competition until the 1st of October, for a process of manufacturing a hydrogen dioxide which shall possess the power to decolorize indigo equal to that of chlorine, and which shall not cost more than ten times as much as that bleach. Left to itself, the perfecting of such an invention may linger for a generation. The prize offered is a gold medal, and the prize winner retains the exclusive right to his invention. This may be all that the Rouen Society can afford to offer, but in view of the great and general benefits to be anticipated from such an invention, the prize should be made international, and societies in Belgium, Austria, Germany, England, and America ought to co-operate with their French sister, and so swell the amount that experts in all nations shall feel the stimulus.—*Textile Record.*

A Remarkable Discovery of Natural Coal Tar.

The Titusville, Pa., *Herald* reports the discovery of a tar-like oil in sinking a well seven miles west of Foxburg, Pa. The oil is jet-black, and has a strong odor like that of "spirits of tar." In its natural state the oil emits on burning a dense black smoke carrying much soot, which suggests its use in the manufacture of lampblack. It is also thought that it may be available in the manufacture of aniline dyes. The *Herald* adds: The strike is certainly an extraordinary one, and as far as we can learn, nothing like it has ever before been known in the history of the oil trade. No other well in or near the vicinity has anything approaching to it. The oil seems to be found in the slate at a depth of 270 feet, and what is the more singular is that, although the drill passes through the same kind of slate and at the same depth in adjacent wells, no such yield as we have been describing has come from any other.

Florida Oranges in England.

London papers are noticing a new American product in the English markets, and, as it threatens no competition with anything raised at home, they seem disposed to give the new comer a hearty welcome. The *Pall Mall Gazette* says: A trial box of Florida oranges, dispatched from Jacksonville, Fla., to this city, arrived in prime condition after a journey of three weeks. Only three oranges were damaged *en route.* The experiment is likely to be repeated on a larger scale, and before long it is quite possible a thriving fruit trade may spring up between England and the Southern States. The supply of oranges in Florida is almost inexhaustible; their quality is said to be much finer than those from the Mediterranean, and if once the trade was established, the time of transit would be materially reduced.