ship is had by electric signals, a separate engine driving the dynamo machine supplying the lighting power. Each room has a separate ventilating pipe from a main fan, also a steam coil for cold weather.

In the race of August 10, between the steam yachts of the American Yacht Club Fleet, from Larchmont, N. Y., to New London, Conn., a distance of 90 miles, this remarkable boat made the distance in 4 hours 44¾ minutes. Allowing some of her competitors one hour's start, she was first in beating the Yosemite, her especial antagonist, by 26 minutes. This latter's blowing fan broke down about the middle of the contest, but it is doubtful if without the accident she could have caught up, the Atalanta having gradually drawn away from her from the start.

The day was stormy, with strong head winds. The Atalanta was well prepared for the contest. Her load line just touched the surface. All her boats were in on deck, and her numerous crew gathered way aft at the start, when they moved forward as soon as she gathered full headway. As her propeller took hold of the water, a small mountain of water and foam rose up, almost obscuring her rail, but gradually subsided as her full speed was gained.

When under full headway, a broad sheet of foam spread from her bows, falling away amidships only to rise again toward the stern. The Yosemite on the contrary seemed to gather but little at the bow, but the swell rose amidships, and then fell away again before reaching the stern. Her disturbance of the water's surface was much less marked than that of the Atalanta, which proved herself in this contest the fastest yacht in American waters.

Boring with Compressed Water.

When the French engineers first began the Mont Cenis Tunnel, says a Paris correspondent of the Boston *Herald*, the work was done in the old-fashioned way by means of hand drills and blasting. Later, machines were invented driven by compressed air, which did away with the hand drills, and by the aid of which the work was successfully completed. Similar but improved machines were employed in the piercing of the St. Gothard; but when Mr. Brandt undertook the piercing of the Arlberg, he proposed to the contractors to substitute compressed water for compressed air. He invented a special apparatus for the purpose, and the experiments made with it in the Westphalian mines were so satisfactory that his proposition was adopted on the western side, while the piercing of the eastern gallery was to be done by the same means as had been employed on the St. Gothard, known as the Ferroux machine. After a few months' experience it was demonstrated that the Brandt was in perforating power the equal, if not the superior, of the Ferroux machines, while it possessed an undoubted superiority for the ventilation of the gallery, and consequently for the health and comfort of the workmen. When I saw the Brandt machine at work, I was struck by the contrast between its smallness and the greatness of the task it had to accomplish. In appearance and size it resembles an old-fashioned 6 pound field piece. The drill has a diameter of 30 inches, and consists of a circular auger, which is held powerfully against the rock by means of a hydraulic pressure of from 100 to 120 atmospheres, while at the same time a rotary movement is imparted to it. The pressure against the face of the rock is the result of a column of compressed water contained in the cannon-like cylinder of the machine; inside of this cylinder is a fixed piston rod, a detail in which the Brandt machine differs from all other similar drills, in which it is the cylinder that is fixed and the piston rod that is movable.

The rotary movement is imparted to the drills by means of a cog wheel acting on the cylinder and moved by a transversal endless screw, driven by two little hydrometric engines placed on either side. The drill will make, according to the nature of the rock, from 5 to 12 revolutions per minute, and it can be driven to a depth of 39 inches. When it is withdrawn a dynamite cartridge is inserted, and the face of the gallery is blown down. By means of four of these machines, a gallery 16,390 feet long, with a heading of ten square yards, was driven into the western side of the Arlberg during the same space of time that six Ferroux machines were driving a similar gallery 17,900 feet into the eastern side of the mountain. The daily rate of progress varied greatly, according to the nature of the rock traversed.

Sometimes a stratum of exceptionally hard rock would be encountered, and sometimes the strata would be so friable that the roof and sides of the gallery had to be immediately protected with shoring. At the start the average daily progress did not exceed 6½ feet, but toward the end 26 feet were the minimum, and 37 feet the maximum, of a day's work. As high as 100 cubic yards of rock were sometimes removed during 24 hours, and an average of 500 cubic yards of masonry were built per day. About 2,000,000 pounds of dynamite were used in this blast, and most of it was manufactured on the spot, in large frame buildings erected for the purpose in isolated spots at either end of the tunnel. In the construction of the gallery the same system employed at the St. Gothard Tunnel was adopted. This system consists in the establishing of a principal gallery, and of a second gallery parallel to and above the principal one. The dimensions of the former were 8 feet high by 9 feet wide, which allowed six miners to work at the same time. The upper gallery, 7 feet high by 6½ feet wide, would only permit four men to work.

OIL is now extracted from the seeds of grapes in Italy. Young grapes yield most, and black kinds more than white.

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THE RETURN SCREW.

To many machinists the production of a return screw for changing a rotary into a reciprocating movement is a difficult job. It is something more, to be sure, than cutting a right and left hand screw separately or independently; for the starting and finishing points of the two threads must be the same, and yet there must be no abrupt corners at either end of the screw. To produce such a dual or returning screw, the work should be properly laid out before it is attempted to be completed at the lathe.

The return screw is a right and left hand thread cut on a short cylinder, each crossing the other, the terminals meeting at some initial point. In practice it is best to have the threads square, with slightly inclined sides. The object of the return screw is to convert a rotary motion into a back and forth movement of perfect regularity. This back and forward movement can best be obtained by means of a lever, by which the ultimate throw can be limited or extended. On a return screw of only six inches length, with four turns of one and a half inches pitch, the writer once produced a practically regular and even reciprocating movement of twenty inches. The lever is moved by a substitute for a half nut that runs in the scores of the thread. Unlike any half nut, it does not reach over two threads—it engages only with one. In fact, it is a crescent shaped piece of steel, with thinned points, having a pivot at the back of its convexity, so that it may turn freely in either direction.

In action the crescent runs along the channels of the right hand thread, as the screw revolves, until it reaches the end of the screw, when it turns sharply on its pivot and traverses the left hand channels to the other end; then reversing and keeping up the reciprocating movement indefinitely. The motion is equable, smooth, and without jar. In some situations this contrivance is better than a cam or an eccentric, or any other method of change of motion from rotary to reciprocatory.

In laying out this return screw, machinists sometimes make the mistake of using one single point for the end returns. This, although agreeable to theory, is not feasible in practice. The crescent shaped traveler cannot turn a sharp corner; its course conforms to the spiral lines of the thread. So the ends of the threads—the places of their union—should be curved similar to the spirals of the screw. Machinists sometimes content themselves with drilling a single hole as a starter for the screw cutting tool for one thread, and the end of the cut for the other thread. This is wrong, for it leaves a corner or angle of only the turn or diameter of the drill, the width of the thread. Two holes should be drilled at a little more than their diameter apart, and on the finishing they can be connected by means of a little chiseling. This will give a curve just sufficient to throw the guide on to the other thread. In beginning a cut on a return screw, it is well to mark the right hand thread, and then before cutting it to mark the left hand thread; the change of gears is a trifling trouble.

THE ANCIENT INTERIOR AFRICAN SEA.

The very precise accounts left us by classic authors regarding an interior sea in the Libyan region of Africa, have always attracted the attention of geographers. The ancients called it the Bay of Triton, and spoke of it as an arm of the sea in communication with the Mediterranean, and distinguished by an island named *Phla*, which the waters alternately covered and exposed. Herodotus and Scylax give these particulars, and Ptolemy at a later date describes a river which flowed into it. For a long time the geographic world failed to locate this sea, but from the studies of Dr. Shaw, of Rennell, Sir Granville-Temple, and MM. Tissot and Guerin, it was supposed that in the historic period the lakes had communicated with the Mediterranean and had formed the Bay of Triton. Commander Roudaire, basing his assumptions on this identification, believed that this Bay of Triton was dried at the commencement of the Christian era in consequence of the formation of an isthmus which separated it from the sea, and that it would suffice to dig a canal between the basin of the lake and the Gulf of Cabe to revive this ancient sea. But later examinations proved that this hypothesis was untenable, as the bed of the Djerid Lake was above the level of the Mediterranean, and M. Fuchs recognized in 1874 that the soil of Cabe was formed, not of beds of sand or recent alluvium, but of strata of sandstone, gypsum, and limestone, and was at least 46 meters above the level of the adjoining Mediterranean waters. But recent geographical discoveries show there is a new basin in Tunis, that of Lake Kelbiah, which embraces all the central portion of the Tunisian plateau and the plain of Kairouan.

A large stream descends from Tabessa and empties into the Gulf of Hammamet, where it debouches between Sousa and Erghéla. At some distance from the shore lies the great Lake Kelbiah, which the river traverses, reappearing beyond under the aspect of a canal of exit, by which Lake Kelbiah during floods empties its surplusage of waters into the sea. M. Rouire, in the *Cosmos les Mondes*, gives some notes of a recent visit he paid to this locality. He had previously studied this region, and had published his conclusions as to its being the site of the ancient Bay of Triton, which had almost been abandoned by scholars as a real geographical locality. His essay awoke a lively discussion, and he was accused of ignorance of the ancient authors and their descriptions. A renewed careful study of Herodotus, Scylax, Pomponius Mela, and Ptolemy assured him that the position of Lake Kelbiah corresponded with its surroundings to the descriptions of these authors.

Herodotus describes the Bay of Triton, between his day and the first century of our era, a shore formed between the bay and the sea, and to the bay succeeded a lake which Pomponius Mela and Scylax describe in similar terms. All these three writers tell us that a large river, the Triton, emptied into the Bay of Triton; but they give us no details as to its source or upon the features of its course. But this gap is filled by Ptolemy, who speaks of the source of this river in Mount *Ousaleton*. In its course three lakes lie—lakes Triton, Pallas, and Libya. These details, with many others, are carefully examined and identified by M. Rouire.

"Thus," he concludes, "source, environs, and delta of the river Triton, the aspect of the country traversed, the lakes in which this stream empties before meeting the sea, all are found identified upon the environs of this new water course in central Tunis."

HORSERADISH.

The botanical name of this well known garden plant and popular condiment is *Armoraciæ radia*, a native of western Europe. It is remarkably tenacious of life, and spreads itself without artificial aid, coming up sometimes at long distances from the parent plants in soils adapted to its growth. The root contains an acrid oil similar to, if not identical with, that of mustard, and to the pungent flavor of this oil is due the desire for grated horseradish as a condiment. It is considered medically as a harmless stimulant, of use in dyspepsia, and a sirup prepared from the root is used in colds and rheumatism.

In some cities, the horseradish is grated at the doors of the customers; or dealers stand at the street corners, and grate from the heaped roots a gill, half pint, or more at the call of the customer. All this work is done by hand, and is intended to counteract the popular idea that turnip forms a large part of the bottled horseradish. This is not so, for the turnip would turn the horseradish black, or discolor it, and, besides, it costs hardly more to raise horseradish than to raise turnips. The absolute whiteness of horseradish (except the color of the vinegar) is a necessity to its commercial value. This whiteness cannot exist in adulterated horseradish. In the manufacture of the grated horseradish in large quantities the graters must be made of white metal or of sheet tin, as the contact of uncovered iron would blacken the product.

The cultivation of the root is simple. At the harvest, in the autumn, those roots which are too small for commercial purposes—less than a pipestem in diameter—are packed away in sand in short lengths of from four to six inches. In the spring these are planted in plowed furrows by means of a hand dibble, making a hole to plant the slip in, upper end just below the surface. It grows with the commonest cultivation—field cultivation—and is harvested by the plow and the potato digger.

In preparation for the market the roots are freed from sand or soil, and are scraped by hand until every discolored portion is removed. The cleaned roots are then put into a tumbling barrel with water, and thoroughly washed. To be ground, they are fed into a hopper over a cylindrical grinder of white metal with its corrugations like those of a nutmeg grater, and held down to its surface by the weight of a block of wood fitting, like a piston, the sides of a rectangular box into which the hopper leads. The grated root is mixed with vinegar, bottled, and sealed immediately. And herein is the trouble about adulterated horseradish. Exposed in a grated form half a day, the horseradish is tasteless; the aroma goes with the air like a whiff. Nor will dry horseradish retain its strength. Horseradish is like the rose; it must be smelled—or tasted—immediately on its ripening, or it is "scentless and dead."

An Artesian Well in Nevada.

A very deep well is being sunk at White Plains, Nevada, on what they call the 40-mile desert, in the neighborhood of the sink of the Humboldt. The well is being put down by the Central Pacific Railroad Company as a test well, not alone for the satisfaction of obtaining water for their own use, but to determine the feasibility of getting it elsewhere on the line of their railroad, as well as in other parts of the State. The only good supply of water for the desert is brought from the Truckee River, 35 miles west of the new well on White Plains, and is hauled in tank cars for the supply of engines and domestic purposes, showing the necessity of testing thoroughly by artesian wells to get water. The desert contains many specimens of Indian curiosities—arrow heads, Indian mortars, etc.—being formerly fine hunting grounds.

A record of the progress of this well will be of interest to many persons. They have found salt water, hot water, and finally, at a depth of 1,650 feet, they came across wood. Mr. W. C. Chapin, who has charge of the drilling of the well, sent to the Academy of Sciences samples of the wood brought up by the drills, and gave a brief record of the material passed through in boring.

From the surface to 20 feet they passed through clay with a four inch stratum of fine decomposed quartz; then to 36 feet it was tufa and cement; then two feet of cobbles, sand, and hard shells. At 38 feet they struck a strong stream of salt water in gravel; from 40 to 70 feet there was sand, cement with seams of rock, and cobbles. This kept on until they reached 144 feet, when they met cement clay, with sand and gravel, which continued to 205 feet, when they met fine brown sand; then down to 300 feet there was cement, gravel, sand, and shell conglomerate. From 300 to 340 feet, compact sand or sand rock; to 367 feet, various kinds of cobbles; then followed white tufa, fine sand, cement, sand, and gravel to 400 feet. A stratum of conglomerate was then found, which passed into cement at 420 feet, where cobbles and gravel were met with, and then fine sand; at 486 feet bedrock was found. Eight inch driving pipe was driven to the depth of 486 feet, the part above this being all surface wash. From 486 to 520 feet was black rock, when red volcanic rock was met, continuing with slight change to 575 feet, where black basalt was found. At 595 feet there was red rock and red mud; then came black rock with seams of clay. From 625 to 635 feet there was a reddish-gray rock with cement, which mixes up with the water—red rock probably from above. Gray muddy rock then came in, and from 655 to 665 feet a reddish-brown sand rock; then a soft green rock. Between 666 and 685 feet there was very compact black sand, and then hot water was struck.

Between that point and 697 feet was reddish-black sand, changing to coarser below, when at 703 they found red rock again, which continued to 745 feet. From there to 950 feet was black, red, and gray rock, in strata. From there to 1,000 feet, and to 1,040 feet was red rock, fine and very hard. From 1,040 to 1,050 the rock was slate-colored. From that to 1,140 black (basalt), and then a red slaty clay, followed by blue clay (slate) and volcanic ash. The volcanic ash continued to 1,300 feet, when conglomerates and rock were met, lasting to 1,550 feet, when a soft, muddy, white rock came in, continuing to 1,610 feet.

From 1,610 to 1,615 feet was a fine gray sand, and from 1,615 to 1,624 was a stratum of *wood*. This wood is not silicified, but is black and hard, though it breaks readily when handled. Some large pieces were found. It is rather remarkable to find wood at such a depth, and so thick. Iron pyrites were found near by. Below this, again, is conglomerate, with some fine sand. At 1,825 feet very muddy rock came in, and also more sulphurets, followed by a soft, dark rock, very loose, and falling in on the drills. From 1,890 to 2,088 feet very hard black rock was met. The well is now down over 2,100 feet, but no water has yet been found, aside from that which is hot or salt, as mentioned.

The work of sinking is, however, being continued, with the hope of eventually striking a flow of water.—*Min and Sci. Press.*

The Effects of the Excessive Use of Alcohol on the Mental Functions and Brain.

Dr. Clouston, of the Edinburgh Asylum at Morningside, the noted author and specialist, in a recent lecture on this subject writes as follows:

The effects of a single dose of alcohol differ widely in different individuals, and this lies at the root of all scientific inquiries into the matter. The variety of the effects on the mental faculties of different brains is also extreme. This indicates such different qualities and susceptibilities in different brains as regards this agent, that it makes the whole question of the effects of alcohol a most complicated one, not to be explained by a few unqualified assertions. In reply to the question, What are the normal effects of alcohol on the mental forces of the brain? the scientific man must reply, What kind of brain do you mean? And it is only by a careful study of the qualities, the tendencies, and potentialities of different brains, that we can answer the first question properly. We need to study the mental qualities of the brain at different periods of life, in the two sexes, in different temperaments and constitutions, in different races, in different states of health and vigor, and with reference to the hereditary tendencies of the organ; for all these things influence the effects of one single small dose of alcohol. So we find, looking from the point of view of the amount of the doses, the effect is very different. There is, I believe, no other agent known which differs so greatly in different instances in the dose needed to produce the same effect on the mental powers as a dose of alcohol, and herein again we find that there must be the greatest difference in the power of resisting the effects of alcohol in different brains. Taking the lower animals, that difference is exceedingly small; an ounce of alcohol given to a dozen dogs of the same size will practically have the effect on them all; but an ounce given each to a dozen men has not only the most different effect in the mental faculties it stimulates, as we have seen, but in the *amount* of the effect it causes. Some brains are exceedingly sensitive to very small quantities; other brains have the power of resisting or tolerating alcohol in a wondrous degree, this being an innate quality quite apart from the effect of the use and custom. These differences are so great as to compel us to conclude that there are enormous inherent disparities in human beings in this respect, and this is no doubt one of the very great dangers in the use of alcohol.

So we also find at the various periods of life, ordinary small doses of alcohol have very different effects. In a child the effect is extremely great; in a boy or girl it is also great, but it is not so great in a growing adolescent. In the two sexes there are also considerable differences, the female having less resisting power, her brain being usually much more susceptible to the influence of this agent. Looking at different races, the difference of effect of the same dose is also extremely great. There are some savage races that are so subject to its influence that a very small dose indeed—half an ounce—will have greater effect on them than two or three ounces will have on an ordinary European. The psychological, the mental, effects of small doses of alcohol are therefore exceedingly various, and we have not yet discovered the precise qualities of the brain which caused these differences. We cannot tell beforehand which brain will be susceptible to its effects, and which will not. Looking at the matter next from a point of view of the effects of a much larger dose, these will be found much more uniform. The effect instead of being stimulating is then narcotic, and we have a deadening, paralyzing, and temporary arrestment of the mental functions of the brain in every individual if a sufficient quantity is taken. But here we find much variety in the way the result is arrived at, when carefully studied.

In one person we have this paralysis, this deadening, taking place first on the intellectual faculties, in another on the emotional, in another on the propensities, and in another on the power of motion. We see a certain kind of mental degeneration of a slight type, which results in those who habitually take an amount of alcohol that is to them excessive. This slow but quite marked type of mental degeneration a doctor of experience soon comes to observe in his patients; and others a certain change mentally, morally, and bodily, in the man who is taking more than is good for him. The expression of his face and eyes—those mirrors of the mind—you see has changed, and for the worse. The mental condition of the man is lowered all round, and especially one effect is noticed, that his higher power of control is lessened. I am safe in saying that no man indulges for ten years in more alcohol than is really good for him without this kind of degeneration being observed, and that although during these ten years he was never once drunk we find him psychologically changed for the worse in his independence of mind, in his spontaneity. After a man has passed forty, such changes are very apt to be faster, and more decided. We see such a man's work and his fortune suffering, but we dare not call him either a drunkard or dissipated, because, as a matter of fact, he has never been drunk, and never intends to be drunk. Whether this degeneration takes place soon or late depends upon inherent resistive capacities of his brain cells. In some individuals the resistive capacity against alcohol is so great that for years they may indulge in its excessive use without this degeneration taking place to any great extent, but in other instances we have it very rapidly developed indeed.

Some men pass into a premature old age and become old at fifty, when they ought to have lived on and been young men up to sixty, and this merely owing to the excessive use of alcohol. Memory and the power of thinking are affected, but you see the lowering most in the finer faculties, the tastes, the more delicate perceptions of things, and the force of character. This is an effect which, I believe, is especially to be observed in men who have used their intellectual powers constantly and vigorously. We often see this effect on the brains of men in our profession of medicine, at the bar, and even among the clerical profession, in a very marked degree, without their owners having been once drunk. In such persons, their mental powers having been greater to begin with, and with a finer edge on them, you notice in a more marked way this degeneration in its progress. This, I may say, is the least marked mental effect of alcohol taken, not so as to produce drunkenness, but taken in greater quantity than the physical constitution of the brain can stand over a long period. In some brains a very small quantity indeed, taken daily, will produce this degeneration.

Mechanical Properties of Galvanized Iron and Steel Wire.

At the wire mills of Witte & Kaemper, a series of tests has been made to ascertain the mechanical properties of galvanized steel and iron wire, with the following results:

	Steel.	Iron.
Diameter, inch...	0·16	0·161
Tensile strength per wire, pounds.......	2447	1345
Elongation, per cent......................	5	15

A torsion test made showed that on a length of 11·81 inches the steel wire could be twisted four times before it broke, while the iron wire stood 18 revolutions. For the tensile tests, the length of specimen was 5·96 inches. The galvanized steel wire is used for wrapping ocean telegraph cables, while the iron wire is used for surface telegraph lines. The steel used is generally made by the Bessemer process, while the iron was puddled from a mixture of Westphalian mill pig, Siegen charcoal pig, and pig from the Georg Marie Hütte at Osnabrück. The quality of the galvanizing is tested either by dissolving the coal in hydrochloric acid or by dipping the specimen a number of times for a given time for each immersion in a solution of sulphate of copper. The wire must not show any signs of a deposit of copper. For the German telegraph service, the sulphate solution is a mixture of one part of sulphate and five parts of water, and the wire must undergo five immersions of a minute each. For the steel cable wire, the specification is a tensile strength of 53 tons per square inch, an elongation of 1·5 per cent., and a bending test of wrapping the wire twice around a piece of wire having the same diameter and straightening it out without breaking it.

THE Louisa County (Va.) pyrites are to be very favorably exhibited at the New Orleans Exposition, in the collection of the National Museum. Samples of massive pyrite, both copper and iron, from veins thirty-seven feet wide, will open the eyes of foreign visitors to resources of this country.