

which a student of statistics or a prophet of the future will be most curious. How came these gains? It appears even that the quantity of oil produced has increased two and one-third times in ten years.

Two new conditions stand out in the mass of facts contained in the 312 pages of data which Mr. F. H. Oliphant, the author of the United States Geological Survey's report, has collected. The most important of these is the fact that for the first time in the history of the petroleum industry the quantity of oil produced west of the Mississippi River was greater than that produced east of that river. New pools were discovered during 1904 in Texas, California, Kansas, Indian Territory, and Oklahoma, and many extensions were made to the old fields. In fact, an immense section, beginning in southeastern Kansas and extending southwestward into northern Indian Territory and Oklahoma, now over 180 miles in length and 50 miles in width, was proved to be locally productive of petroleum and natural gas. The possibilities of this great area and the effect of its output on the petroleum market constitute an important problem, the solution of which remains for the future.

All indications point to an increase in the production of petroleum in the United States for a series of years. Most of the petroleum produced in these western localities is, however, inferior in quality. It is not suitable for the manufacture of the most refined products, but its high heating value and its freedom from the more volatile constituents render it comparatively safe to transport and consume and make it a most valuable fuel.

The second notable fact revealed in this last petroleum report is that the automobile would seem to have set the pace for the rise in the demand for refined petroleum. According to the report, demand was made in 1904 "especially for the lighter grades used in internal-combustion engines of motors."

Many other interesting facts are set forth in this report, which is one of the government's free publications. It contains an account of the oil production in the United States by fields, States, and districts, with much historical and statistical matter, comprising statements concerning imports, exports, and prices of petroleum, as well as tariff duties, descriptions of methods of transportation, analyses of United States petroleum and its derivatives, and a discussion of the calorific value of petroleum. The last hundred pages of the report are devoted to an account of the operations of the petroleum industry in 1904 in the other countries of the world.

Mr. Oliphant's report is published as an extract from the Survey's forthcoming volume "Mineral Resources of the United States, 1904." Applications for copies should be addressed to The Director, United States Geological Survey, Washington, D. C.

A GLASS OF MADEIRA.*

By F. G. AFLALO.

THE experienced traveler respects a well-worn maxim that he should, where possible, drink the wine of the country, extending, in fact, to his potatoes, moderate or otherwise, the excellent principle of doing when in Rome as Rome does. Very insular Britons resent such excursions into the unknown, and prefer, when conning the wine-list at their hotel, to halt at the familiar landmarks, ordering the usual pint of French claret or German hock for lunch, the usual pint of goodness-knows-what champagne for dinner, and the usual glass of alcohol and mineral water between whiles. To this category belongs also the healthy and patriotic type of islander who, spending the inside of a month in an interesting foreign country, forthwith seeks out his compatriots and in their company passes his days at cricket and his nights at bridge.

The more seasoned wanderer, on the other hand, indulges in the hitherto untasted products of the country. Should his travels lead him to the ocean paradise called Madeira, the very name points out the clear way. If he takes a furnished *quinta*, he must consult a wine-merchant in his quest of a light and inexpensive madeira ready for table use; if, on the other hand, he intrusts his comfort to the Palace Hotel, the very first page of the wine list gives him a round dozen for choice. He need go no farther; he need not seek out the Moët or Pommery; for the Pommard and Chambertin he will spare a friendly nod of recognition and no more; he will cold-shoulder the Liebfraumilch and Marcobrunner; the Lafite and Margaux he will, with the rest, leave for the fullness of his days at home. For the moment let him dally with the madeiras, most of them worth sampling, yet none, perhaps, inviting lifelong devotion to the exclusion of other wines. Other Portuguese, but not island, wines are given on a later page: Bucellas and Collares, excellent light table wines for hot weather, mixing well with mineral waters, and making an admirable groundwork for "hock-cup." The madeiras proper range in price from eighteenpence to two lawyer's fees the bottle, and frankness compels the admission that there is one of them in whose company I would rather sit for half an hour and pay, than enjoy gratis a week of that of either my own lawyer or the solicitor-general.

Other skies, other habits. Madeira never appealed to me at home. Like sherry, its place in the well-ordered life seemed as an adjunct to turtle soup or to purées of humbler antecedents. To drink a couple of glasses between meals would, in hot weather or cold, have struck me as cold-blooded, wanton tippling. Never

again shall I look askance at the man who welcomes a glass of madeira after a hot ride. Outside the island itself I know not whether even now such preference would appeal; but at the English rooms in Funchal, in a certain cool wine cellar in the presence of venerable butts and octaves, and in a lovely *quinta*, its garden ablaze with flowers and aquiver with the bubbling music of rare captive birds, the juice of the local grape has many times attuned mind and body to a mood of perfect peace.

There is of course madeira and madeira. Memory recalls a glass of very thin brand, swallowed hastily (else it had never been swallowed at all) during a hot ride through Cama de Lobos, the center of a busy wine district. Quaffed in the saddle on a sunny afternoon of May, it pleased despite its faint bouquet and meager body. Memory recalls also a glass, several glasses, taken with more fitting deliberation, in a cellar in Funchal, a '68 wine of beautiful character, a wine just two years older than the throat down which it trickled like a liquid poem. Madeira is not a wine to take quite seriously, like port. All these Atlantic archipelagoes produce wines with which to trifle soberly. Six or seven years ago, when staying at Orotava, in the Canaries, a friend and myself started at either end of a long list of native wines. These were without exception inexpensive; also, we took no more than a wine-glass of each, and tasted only such as were quoted in half-bottles. My friend climbed up, and I climbed down, until each had struck something to his taste and stubbornly refused to move farther, so that the middle dozen went untasted.

The hotel at Funchal does not offer so wide a range in madeiras. Half a dozen malmseys (one dated 1790, and a second the year of Waterloo), a couple of tintas, a sercial, and a bastardinho are among the most in-

it artificially during its early stages, clarifying, fortifying, and otherwise improving until in a fit state to dispatch to its dwindling admirers abroad. Some of the cargo boats take it *via* Lisbon; others voyage direct to the Baltic ports—for Russia, even in her times of stress, is among its warmest supporters. The bulk goes away in wood, in hogsheads or octaves, or even in smaller measure, but a few private orders may go in bottle. Having been laid down in wood for three or four years, it may be kept in bottle for as long as the term of its owner's patience, steadily improving in quality and not deteriorating like many wines of other character. Decanting should be done by one who knows how, and a uniform temperature should be insured between bottle and decanter if the delicate liquor is not to suffer by the change of quarters. This is the day of the large shipper, and a couple of English firms, one established at Funchal so long ago as the time of the Forty-five, probably share about two-thirds of the entire export trade.

That this is what it was no one pretends. It has lasted at any rate for four centuries, and the vine, originally introduced from Crete, has in that period made itself thoroughly at home on the lower slopes of these volcanic hills. Yet a wine cannot lose its vogue in so wealthy a land as Britain without suffering, and the United Kingdom no longer counts seriously among its customers. Edinburgh, once a strong supporter, knows it no longer. Time was when a maiden aunt brought out a glass of rare madeira for her favorite nephew, and old sea dogs who basked out the sunshine of their day in trim cottages on the Devon coast would bring a dozen bottles over from their last voyage and bring one out on state occasions for their cronies. To-day all this is changed, and champagne and port will soon be the only wines found in the average English country house. Here and there, however, a conservative tradition keeps madeira in its place of honor; and there is at any rate one hospitable mess where every evening the port and sherry go round the dinner table untouched.

To essay any explanation of these changes of fashion is hopeless. The fault is not in the wine, for there is as good in cask to-day as ever went across the ocean. It is simply out of vogue. And since even in our cups we are sheep, it would quickly regain its popularity with us if only patronized by those whom lady novelists love to describe as "very august personages." France, Denmark, Russia, and the United States are still good customers.

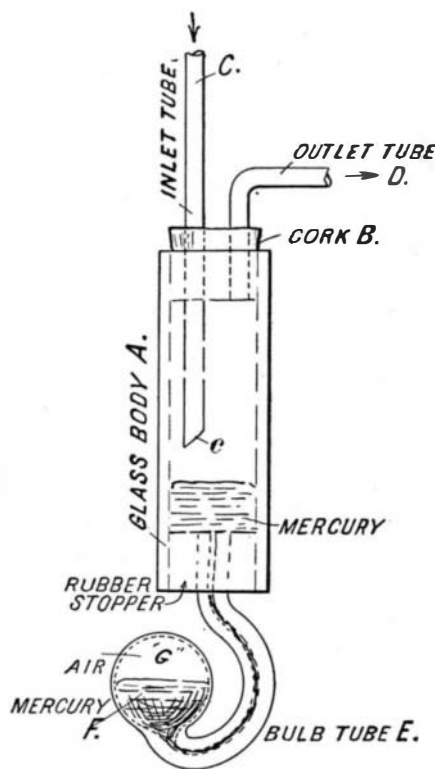
The report for 1904 by Mr. Vicars, the British consul, bears this out, and shows a considerable decrease in the export of wine from Madeira from the previous year. From one cause or another, he says, madeira wine has gone completely out of fashion at home, partly, no doubt, by reason of the ever-increasing favor of lighter wines, but also in great measure for no other reason than that it is no longer a fashionable wine. He mentions a case of a private importer who invariably passed off his madeira as brown sherry, under which name it was exceedingly popular with his guests, who, he maintained, would not have touched it had the decanter been labeled madeira.

A THERMOSTAT FOR AMATEURS.*

By EDWARD F. CHANDLER.

A DEVICE for controlling the temperature of drying ovens, incubators, and kindred apparatus may be found in the catalogue of almost any laboratory supply house under the heading "Thermostat." Although a cut generally accompanies the brief catalogue description, there is seldom enough detail to assist in the construction of one of these instruments.

That this important little piece of apparatus is very simple will be seen from the description of the accompanying sketch, which shows the complete arrangement. As the sketch is in its proper proportions, I will not give figures, as it is quite impracticable to attempt to anticipate the demands of each individual case. I might suggest, nevertheless, that for general use in connection with an oven of about 500 cubic inches capacity a body tube $2\frac{1}{2}$ inches long and about $\frac{5}{8}$ inch inside diameter is very satisfactory. The bulb should be in this case about $\frac{3}{4}$ inch diameter outside. The body, *H*, is made of tough annealed glass tubing. In the top is a cork stopper, *B*, with two perforations. Through one is inserted the supply tube, *C*, which is ground off at an angle of about 45 deg. at the lower end, *c*. The other perforation holds tube *D*, which is the outlet tube (and is connected with the Bunsen burner by a rubber tube). This tube is set in flush with the lower surface of the cork. At the lower end of the body is a rubber stopper with a single hole, fitted with the stem of the bulb tube, *E*. The bulb tube is bent so as to allow the mercury, *F*, which about half fills it, to rest over the capillary opening in the stem. The space, *G*, above the mercury contains air, upon the expansion of which depends the working of the instrument. The filling of the bulb tube is similar to the making of a thermometer (very nicely described in these columns of some time back). For the benefit of those who missed this article, the following will be a help: Seal the end of a piece of capillary tube about 8 inches long; heat the sealed end in the flame of a blow-pipe, and when soft remove from the flame and blow steadily into the open end until the proper-sized bulb is obtained. Now heat the neck of the bulb and bend same to the required shape. Allow the piece to cool gradually, then score with a file and break off the tube to the desired length. The finished tube is next



A THERMOSTAT FOR AMATEURS.

teresting, though not all will suit the same palate. The season of the vintage is August and September, a little earlier on the south side of the island, a little later in the shadier north, and the overlaid vines are then relieved of their great bunches of red and white grapes, which are trodden in the press and crushed by the beam, the must, collected under the supervision of an employe of the exporter, going straight to the store in skins. These have to be borne thither on men's shoulders over steep and narrow mountain-tracks that allow of no other portage. Fortunately, the very steepest of these goat-paths are outside the route of the wine-carriers, for the vine is no plant of the peaks, flourishing only to a reasonable height above sea level, so that it clothes only the feet of the sublime Pico Ruivo, the summit of the island, Madeira's closest intimacy with the empyrean. Some of the finest vineyards are situated on the high ground west of Cama de Lobos, one of the most picturesque fishing ports on the south coast; and both red and white grapes are used in making madeira, the only other native wines being a little muscatel and a rough red claret from the northern districts.

The age of fast steamers has not been without its influence on Madeira's wine industry. In olden times, when a sailing ship took months to cover the distance between Falmouth and Funchal, the wine was shipped in a crude state, and the heat of the hold was, on so long a voyage, sufficient to bring it to maturity, though this system entailed a wastage of anything up to 10 per cent. Some of the finest wine cruised east to Calcutta or west to Jamaica before reaching the merchants in Leadenhall Street. To-day, however, when Union Castle steamers exchange the mud of Southampton for the crystal water of the Funchal anchorage in little more than three days, and when even cargo steamers link the vine-clad island with the cold lands of the North in twice that time, the wine is brought to perfection in the land of its being, and shipped thence ready for use. The exporter, that is to say, keeps it in the wood for several years, heating

* Chambers's Journal.

* Specially prepared for the SCIENTIFIC AMERICAN SUPPLEMENT.

inverted, allowing the open end to dip into a cup of mercury. Applying heat to bulb will drive out most of the air, and if the end is held under the mercury until cool, some of the quicksilver will be drawn back into the bulb and stem, which completes this member. The next operation is to insert the end of the bulb tube in the lower stopper (see sketch) and to put a little mercury in the reservoir as shown. It will now be seen that when a gentle heat is applied to the bulb the air expands and pushes the mercury through the capillary tube into the reservoir, which in turn rises, and upon coming in contact with the end of the tube, *C*, closes the opening at *e*, making a valve, which would shut off the gas, if flowing in at *C*, the supplying tube. The tube, *C*, is drawn up or pushed down so as to shut off at a predetermined temperature, and therefore, when the oven starts to overheat, the mercury rises and entirely or partly closes the inlet. The grinding of the end of *C* to 45 deg. makes the change less abrupt. As the thermostat would entirely cut off the gas supply when above the required temperature a small auxiliary burner is supplied which burns continuously and relights the heating jet upon the opening of the valve. In this way a regular temperature may be maintained for an indefinite time.

EXPERIMENT WITH ELECTRIC SPARK.

The source of electricity to be employed is, at a minimum, six bichromate of potash elements, or six Leclanché elements, or, better still, a small Gramme magneto-electric machine. The experimenter, having found that whatever be the interval that separates the copper wires fixed to the poles of the source, no electric spark jumps between them, may produce what is called the interruption spark. The experiment may be rendered more brilliant by means of quite a coarse file, *L*, the extremity, *A*, of which is connected with the pole of the electric source. The negative wire is grasped by the insulating part and its extremity is moved quickly over the ridges of the file. Brilliant sparks are obtained, particles of iron are volatilized and handsome bluish gerbs are observed. These luminous effects will become still more intense if the extremity of the wire terminates in a small brush made of fine copper wire.—Translated for the SCIENTIFIC AMERICAN SUPPLEMENT from *La Science au XXme Siècle*.

IMAGININGS IN A MOUNTAIN OBSERVATORY.*

1. The average temperature of the earth has been decreasing continuously throughout all periods of geological time.
2. It will continue to lose heat until all has escaped into space.
3. The sun is a medium-sized dying star.
4. It will lose all its heat.
5. The earth can be destroyed by a comet.

Here are three possible ways in which the human species may be annihilated. It is certain that the race will be totally destroyed. We are, therefore, not permanent in nature. We have no abiding city, and are sojourners. The sun has passed the zenith of its glory, is no longer white-hot, and is cooling. Human beings are mere creatures of temperature. It is surprising to see how slight a change either way in solar heat would end our career on earth. The earth has passed through vast changes in temperature. Formidable glacial epochs have occurred. The last one killed many millions of enormous animals, for tons of bones now fill ancient caves, and are buried in the drift. If men lived then, they died along with their animal associates. No proof is had of vast antiquity of man; he belongs to the geological age known as the Recent. That is, he appeared after the sun began to die. For without doubt he could not have existed when the sun was pouring out its heat in maximum floods. The career of man is evanescent indeed; vast cosmic energies must cease raging, and almost the hush of silence obtain, that he might come. A mere breath, a slight period of solar turbulence, can at any time terminate our existence. If we ascend the highest mountain we die with cold; or descend to the deepest mine, we expire with heat. Thus we are living between two sides of a thin film. We cannot escape. The chemical constituents of our bodies have slight affinity, and can be separated easily. And it is exceedingly easy for that pair of inscrutable mysteries, life and mind, to fly away from their unstable home. Man with a reasoning mind is therefore of comparatively late appearance geologically, though the time since he stepped upon the cosmic stage is long in years. Thus mind is the latest and most refined product of the mysterious laboratory of nature.

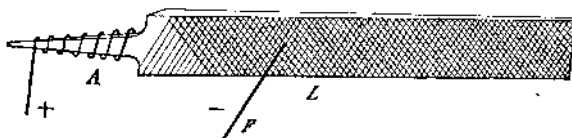
MIND.

I am never alone on the mountain and under the silent stars without thinking about the marvels of mind. The new science, mentalism, is as fascinating as astronomy. And it is more complex. The enormous mail received here reveals the fact that strange mental phenomena are happening. And they are increasing; or, at least, more are recorded. Twice I have written in the *English Mechanic* that the top of a mountain is a wonderful place. All alone and at night! And the profound mystery is deepened beyond all computation by the telescope. An incredible thing about it all is that it does seem as though Nature ought to speak. There is an inexpressible fact about mind wholly unknown to man at present. I expect any day to hear that some mentalist has made a startling discovery. Oh! if human beings would only study harder, find out more of Nature's laws, and then obey

* *English Mechanic*.

them! How many more centuries must pass before men see that they must obey the laws of nature, or surely and inevitably suffer the consequences. People think they can break the laws of nature and escape results. This is utterly hopeless.

"Man is, from a purely structural and animal point of view, very closely united with the animal kingdom. He has no department of his own, but belongs to the Vertebrate department, along with quadrupeds, birds, reptiles, and fishes. He has no class of his own, but belongs to the class Mammalia. Neither has he an order of his own, but belongs to the Primates, along with monkeys, lemurs, etc. But from the psychological point of view it is simply impossible to overestimate the space which separates man from all lower things. Man must be set off not only against the animal kingdom, but against the whole of nature besides, as an equivalent." (Le Comte, "Geology," p. 629.) Here a great scientist places man equal to all else in nature. It is true, good mathematicians and other revealers of nature's laws are equal to all nature beside. Now, if the base of nature is mental, or if this mind has a trace of analogy to the human kind of mind, it is incredibly unaccountable why no information is ever given to waiting man. Kepler toiled seventeen years to find his three laws. Newton labored year after year to discover gravitation's majestic laws, and all discoveries come from arduous labor. Many students wear their lives out in research, adding a point or fact, and then die. It costs dreadful toil to bring a law of nature to light. The steam engine, railways, telegraphs, telephones, printing presses, and mathematics, and everything we have, upon which civilization is based, is due to severe labor. The standing mystery is, Why does not Nature speak to her child? That is, if she is mental. If not, their inquiry is useless. Man being equal to all other things in nature, does not need to worship. Adoration is now obsolete. Man with a normal mind cannot help loving those glittering gems—those diamonds, rubies, sapphires, opals and pearls—all suns piled on suns by the billion; also the circling planets in space; nor this beautiful world, the earth, with its mountains and tossing sea—even if they will not speak to him, but remain as mute as the stony lips of the Egyptian Sphinx. How man longs for Nature to become articulate and give him some hint, some help in the solution of her riddles. But



EXPERIMENT WITH ELECTRIC SPARK.

no; he must pass through labors greater than those of Hercules to add anything to our present store of wisdom. He must walk alone. To one not versed in such matters, and who does not know of the toil of days, months, and years in a modern laboratory, where men actually wear their lives away in search after nature's laws, it is perhaps well to say that the human frame has not been subjected to such tests of endurance in all history. But, if possible, they must henceforth work harder than ever. The ship of Science is now scarcely out of the harbor, has not "crossed the bar," and is not yet fully "launched in the deep."

I am well aware that my language in letter 287 is severe, and that some readers were shocked. But really, I am taxing my strength for the benefit of mankind, and for the dissemination of the sweet, the good, the pure, and the true. It pains me to see man crouching and groveling in the dust, in puny worship. It is all unnecessary and not required. For twenty days I was with the chief representatives of the human species, the highest that have appeared, at the great Congresses of Science in St. Louis. I was in a room with eighty-two of the chief mathematicians on earth. Each one could weigh the earth, the sun, and stars. The vast mechanics of the universe was an open book to them. And in the World's Congress of Electrical Engineers I saw men who are able to "wire" this planet and make it an electrical home of beauty and happiness for all mankind. I attended, perhaps, a hundred of these meetings, where 980 men, all told, with mighty intellects, grappled with Nature, struggling to wrest her mysteries away. They wanted to find more laws, to be applied to the betterment of man and increase of his happiness. Not one of these meetings opened with prayer; supplication was not heard: work was substituted. And the highest of the human race filled the rooms. The present vast expansion of mind cannot be much longer chained by cancerous creeds, catechisms, corroding confessions of faith, or bibles. Science, natural law, and truth will burst all festering bonds, and the mind will at last be free. Positively, creeds are absolutely useless in the twentieth century—the century of the reign of mental law. An established church is a national incubus. All hierarchies must go soon; and will, except that hideous monster, the hierarchy of Rome. It has its awful clutch on the throat of man, and hangs on with the grip of a tiger.

MIGHTY CHANGES NOW ALMOST HERE.

The existing order must be upset. First cut every church steeple down to the roofs. Remove the cross, that priapic emblem of an age of savagery, from the sight of man. Turn half of the churches into lecture halls and scientific laboratories. Have moving pictures of natural world-wide scenery; of cities, and all races of the earth in panorama. Have lectures giving the new discoveries to date. So much labor-saving

machinery is now in use that holidays could be had every sixth day, and then do the world's work. Perform all kinds of electrical, chemical, and physical experiments for the blessed children. Project the wonders of the world of the microscope on the screen. Teach the laws of Nature in easy lectures, every statement illustrated by pictures, so the little tots could get glimpses of the splendors of Nature. Teach temperance and rigid morality. Burn the catechisms. No set of words ever written are so deadly and terrible. I read two to-day—the Methodist and Presbyterian. Human ingenuity cannot sink thought to more terrific and appalling depths. Human reason stands aghast before the hideous language where innocent children are said to be cursed with "original sin." How much more beautiful to show the little ones the teeming life in a drop of water, or the wonders of a flower or leaf. Ransack nature for the children. I have lectured to the dear boys and girls, and so intense was their interest, with stereopticon, electrical experiments, and the microscope, that they were unconscious of the flow of time. And I have seen suffering just as intense. I have seen the fires of hate and rebellion rising in the hearts of youth when cursed by the catechism. The other half of the churches I would turn into theaters. I would make the drama a majestic science, and would let each child in the entire nation take part in moral dramatic scenes, with music, art, and all good things galore. The awful horrors of the catechism would never be heard by a child if I had my way. Their young lives would never be saddened and crushed in blackened gloom by hearing of a raging God and imaginary hell. The suffering of children and young people all these horrible centuries, caused by being deprived of the glories of this lovely world one day in seven, and forced to study mind-killing, brain-curdling catechisms, has been so terrible that description is useless. I have suffered these horrors myself, and know whereof I speak. I would make every sixth day a national legal holiday, given up to the enjoyment and happiness of the people. From 10 A. M. to noon I would have highly-entertaining illustrated scientific talks to the children, with a wilderness of instruments, microscopes, electrical and physical experiments, biological and botanical. The young people would take part in the highly interesting manipulations. Every known kind of scientific instruction would be given in popular language to adults in every dismantled church. The people would hear of every advance made by humanity every sixth day. They would become twentieth century people, with intelligence beyond comparison. I would drive horror and gloom of savage, bloody religion from the fair face of the earth. "Sunday schools," like these here described, are now springing up in many places in the United States. Interest is so intense that children beg to attend. No allusion is made to religion; prayer is never heard. Light gymnastics, marches, graceful drills, with posing and culture, have been substituted for silly, senseless, useless prayers. Music is always round about, with singing. And you ought to see happiness glowing and beaming on the faces of the children, and the light of joy on the features of their parents. These are not called Sunday schools, but lyceums. They have reached a responsive chord in the human mind. From noon to night the time I would have the people pass in social entertainment, visits, excursions by rail and boat, games, athletics, and other means of securing happiness. All brutal things, like fighting of men or animals, and of racing horses until their hearts burst, I would punish by imprisonment in the penitentiary. I would eliminate primitive savagery from the mind of man, and substitute enlightenment, and mercy. In the lyceums, where tried happiness surpassing any known to children before reigns supreme, they never hear of hell, catechism, creed, or any nameless horror of the past. I would as soon draw the children into line, and give each a bottle of whisky as to hand them any original-sin catechism. They are equally deadly to mind.

THEATERS IN THE EVENING.

I would make the drama a standard science, and carry dramatic expression, art, and elocution to the highest state. Historic and moral dramas would be played within the spireless church buildings in the evenings. The people of the neighborhood would alternate in being the actors, and rustic home-made plays would make young and old free from "loads of care." Trained troupes from cities would often visit every little village. Hundreds of schools of dramatic art would spring up everywhere, and lectures, concerts, recitals, oratorios, with all intellectual things, would resound throughout the land every sixth evening.

THE GREAT NEW SCIENCE, MENTALISM.

I would apply its teachings to education without delay. I would so completely upset present methods of teaching that a new type school could scarcely be recognized. I would almost change the present types of mind, and develop new kinds of human beings, like hundreds of new kinds of plants by Burbank in his marvelous California gardens. Every phase of mental culture would be based on this wonderful new all-embracing science of mind. The possibilities of this science are so great that the entire career of man can be changed by it. This science is based on differences in the minds of pupils. Born poets will not be taught the higher mathematics, and mathematicians will not be forced to wear their lives away in studies for which their minds are unfit. Two sciences are rising in the United States; they will break down all barriers and