The Proper Weight of Man.

Prof. Huxley gives the following table of what a full grown man should weigh, and how this weight should be divided: Weight, 154 pounds. Made up thus: Muscles and their appurtenances, 68 pounds; skeleton, 24 pounds; skin, 10½ pounds; fat, 28 pounds; brain, 3 pounds; thoracic viscera, 3½ pounds; abdominal viscera, 11 pounds; blood which would drain from body, 7 pounds. This man ought to consume per diem: Lean beefsteak, 5,000 grains; bread, 6,000 grains; milk, 7,000 grains; potatoes, 3,000 grains; butter, 600 grains; and water, 22,900 grains. His heart should beat 75 times a minute, and he should breathe 15 times a minute. In 24 hours he would vitiate 1,750 cubic feet of pure air to the extent of 1 per cent; a man, therefore, of the weight mentioned ought to have 800 cubic feet of well ventilated space. He would throw off by the skin 18 ounces of water, 300 grains of solid matter, and 400 grains of carbonic acid every 24 hours, and his total loss during the 24 hours would be 6 pounds of water and a little above 2 pounds of other matter.

In this connection we read that Dr. Schweninger, of Munich, has discovered a new mode of reducing the bulk of the human frame. It is, never to eat and drink at the same time, but to let two hours intervene. He has, it is said, cured Prince Bismarck of a tendency to obesity in this way.

Fat people have now their choice between four systems: 1. The original Banting, which consists of eating nothing containing starch, sugar, or fat. 2. The German Banting, which allows fat, but forbids sugar or starch. 3. A Munich system, which consists of being clothed in wool and sleeping in flannel blankets instead of sheets. 4. Not eating and drinking at the same time.

The New Cunard Steamship Umbria.

This new ship is expected to reach New York about Nov. 6. On her recent trial trip the vessel steamed a distance of thirty miles at a speed of twenty-one nautical miles an hour. A marked increase of speed may be looked for when her machinery is in thorough working order. The Umbria is the largest vessel afloat, with the exception of the Great Eastern. She is 520 feet long, 57 feet 3 inches breadth of beam, and 41 feet depth of hold, and measures over 8,000 tons. The vessel was built in the Fairfield yard at Govan, where a majority of the fast steamers of late years have been constructed. Her great breadth affords room for a wide saloon, which is 76 feet long, 9 feet high, and lighted by a lofty cupola skylight. The whole of the saloon is paneled with oak, slightly carved. The electric light is used. The Umbria will carry 720 first class passengers, and has no steerage accommodations. The engines of this magnificent work of marine architecture are the most powerful in the world. The center high pressure cylinder is 71 inches in diameter, and the two low pressure are each 105 inches, with a 6 foot stroke. The screw is made of manganese bronze, cast in the Fairfield yard. The qualities of manganese bronze, combined with the development in practice of the true proportions of the screw propeller, are computed to add upward of a knot an hour to the performance of the old fashioned cast iron blades. The vessel is fitted for the Admiralty service, and can carry coal for 16 days when moving continually at a speed of eighteen knots an hour.

Freezing of Seneca Lake.

A correspondent writes us, mentioning circumstances and witnesses, of the freezing over of Seneca Lake two successive years on May 5, 1860–61, with a thin sheet of ice like window glass. Appleton's Cyclopædia also mentions its having frozen over March 22, 1856, although, aside from these instances, it has never been known to freeze over even in the coldest winters.

The lake is situated in the western part of New York State, is 37 miles long and two to four miles broad, 630 feet deep, its surface about 200 feet above Lake Ontario, and 450 feet above the Atlantic.

A STATE Association of Inventors was organized in Kentucky, Sept. 17, as a branch of the National Association formed at Cincinnati last March.

THE LIVING ORGANISMS OF THE ATMOSPHERE.

As well known, the depths of the ocean were for centuries regarded as abysses inaccessible to the sight, and it was taught that no living being could exist in the darkness that reigned therein. Yet it was only necessary to cast the lead and trawl into the submarine valleys to discover therein an entire flora of wonderful richness and beauty, and an entire fauna of singular beings regarding whose form and nature there could have been no suspicion. On another hand, the microscope has revealed the existence of innumerable animalcules in the least drop of water taken from any spot whatever on the surface of the ocean, and, in the very place where it was believed that there could be nothing but inert matter, the presence of life has been discovered in its completest development.

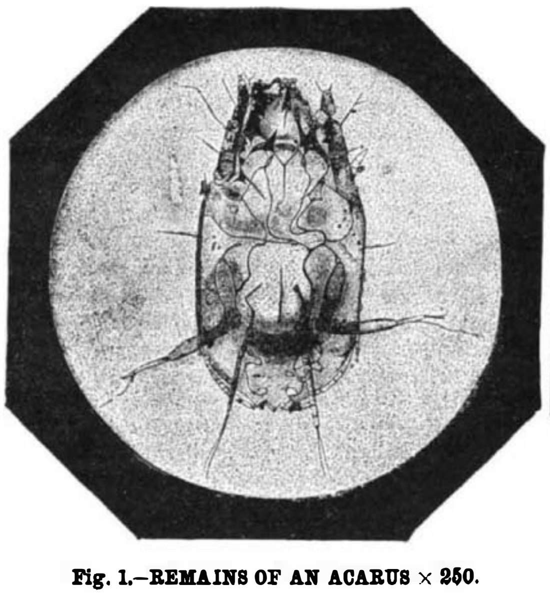

Fig. 1.—REMAINS OF AN ACARUS × 250.

Fig. 2.—SPORES OF ALTERNARIA × 400.

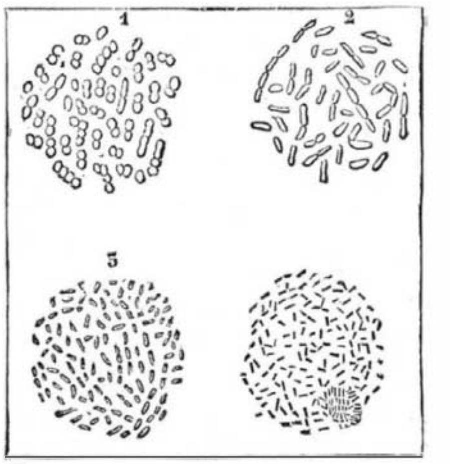

Fig. 5.—ATMOSPHERIC BACTERIA × 1000.

It is the same with the atmosphere. In that transparent, invisible, ungraspable air in which for centuries nothing has been seen but winged birds and insects, the microscope shows us to-day a whole world suspended, unbeknown to us, amid the dust that is continuously floating about. The air is no less peopled than the ocean, and, just as we see sediment, infusoria, and algæ in a drop of ocean water, just so we find in the least volume of air collected near the earth dust, vegetable debris, living organisms, and infinitely small animalcules, which live, feed, develop, and reproduce themselves, and germs of fermentation and putrefaction—those noxious organisms in which Mr. Pasteur has found the cause of so many maladies that afflict humanity.

In recent years the question of atmospheric dust has been studied by the aid of new methods, by a learned investigator, Dr. P. Miquel, chief of the micrographic service of the Montsouris Observatory. This gentleman has collected together a description of his processes and analyses, and the results that he has obtained, in a remarkable work which we shall now make known to our readers by extracting therefrom a few interesting and little known facts.

We shall not speak of the methods by means of which we may collect atmospheric dust and aerial sediments; it will suffice to say that they are usually based upon the filtration of a certain volume of air, and upon the condensation of the aqueous vapor which it contains and which carries along the dust in suspension, or else upon an examination of the sediment from rain or snow water that has been collected in special vessels.

We shall give at present a few specimens of the productions that Dr. Miquel has found in atmospheric dust during the course of his long and patient researches. Cadavers and debris of animal and vegetable nature are very frequently met with in the corpuscles of the atmosphere. Herein we find butterfly scales, down from the bodies of birds, parts of insects' bodies, and sometimes even the entire carcasses of acarians (Fig. 1). The nature of the organized corpuscles of the atmosphere is exceedingly varied, and starch grains, spores of cryptogams, and complete unicellular plants are very abundant therein. Fig. 2 shows, under a magnification of 400 diameters, two spores of *Alternaria* near a blackish mass, which is nothing else than a lichen spore that did not come within the focus. Fig. 3 represents a few very common types of aerial spores. At *b* is seen a large number of young and tender cryptogams that are very abundant after rains. Fig. 4 shows a few other specimens which Dr. Miquel collected from the air of the Montsouris Park.

Since Mr. Pasteur's great labors in this field, the study of the animalcules of the atmosphere, and of the bacteria, bacilli, and vibrios that are found in suspension therein, has offered great interest, and Dr. Miquel has succeeded in throwing much light upon it. In order to collect atmospheric bacteria, it is necessary to have recourse to delicate methods, and notably to examine under strong magnifications the liquid formed through the artificial condensation of the aqueous vapor of the atmosphere—that which, for example, stands upon the surface of an internally cooled glass vessel. For our part, we have also often met with bacteria in drops of dew that we had gathered in the country upon herbs at daybreak.

Fig. 5 shows, according to Dr. Miquel, four specimens of atmospheric bacteria. "The first," says the learned observer, "approaches the *Micrococci* in appearance and the *Bacteria* in mobility. The second might serve as a type to the species; its adult articulations, four one-thousandths to five one-thousandths of a millimeter in length, are about one one-thousandth of a millimeter in thickness; it appears to be the same thing as the *Bacterium lineolum* of Cohn. I have met with it quite frequently in the dust of hospitals. The third has the appearance of the *Bacterium catenulum* of Dujardin. The air shows several varieties of this, and one of them, which I have cultivated, has the singular property of converting one gramme of sulphur into hydrosulphuric acid in forty-eight hours in 4 liters of boiled water, to which has been added tartrate of ammonia and an excess of sulphur. The bacterium marked No. 4 is a microbe of exceedingly small size, and it is necessary to accustom the eye for a long time to the light of the microscope in order to see it detach itself as a shining or black object upon the field rendered luminous or dark. It is found quite frequently in the course of development in the matter secreted by several micrococci."

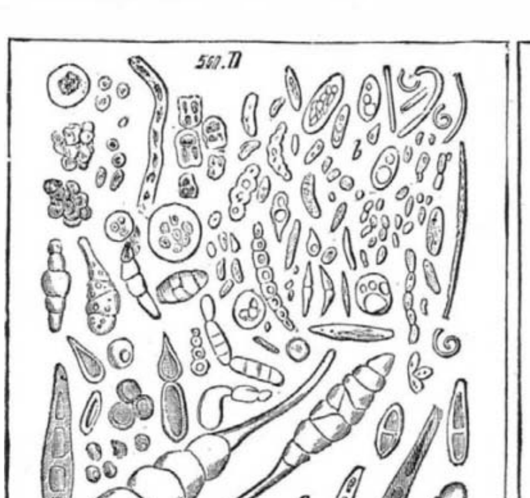

Fig. 3.—SPORES OF CRYPTOGAMS × 500.

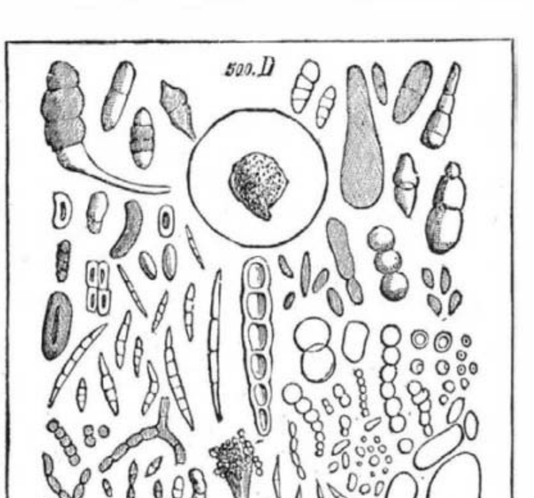

Fig. 4.—SPORES OF CRYPTOGAMS × 500.

Such are the living organisms that belong to the class of microbes whose existence and role has been revealed by Mr. Pasteur. When we consider these infinitely small objects—true dots in motion—under the microscopic objective, we cannot rid ourselves of that singular impression that Michelet, in his poetic language, has so well called "the vertigo of infinity." What would not one give to have at his disposal a still more powerful microscope, that would permit of seeing better, and of distinguishing the details of these beings' organization?

But *cui bono?* One would then doubtless discover still smaller ones yet which would defy science anew.—*La Nature.*

The Foresight of Insects for their Young.

In no manner is the mysterious influence of instinct over the insect world more remarkably manifested than by the care taken by parent insects for the future welfare of offspring which they are destined never to behold. As the human parent upon his deathbed makes the best provision he can for the sustenance and prosperity of his infant children, whom death has decreed that he may not in person watch over, so those insects which nature has decreed shall be always the parents of orphan children, led by an unerring influence within, do their best to provide for the wants of the coming generation.

The butterfly, after flitting through her short life, seeks out a spot whereon to deposit her numerous eggs, not—as one might expect of a creature devoid of mind—upon any chance plant, or even upon the plant or flower from which she herself has been wont to draw her sustenance, but upon the particular plant which forms the invariable food of the larvæ of her species. The various kinds of clothes moths penetrate into our cupboards, drawers, and everywhere where furs, woolen garments, etc., are stored, that they may there lay their eggs, to hatch into the burrowing grubs which are the terror of our housekeepers. The ichneumon tribe, one of nature's greatest counterpoises to keep down the too rapid increase of the insect world, lay their eggs in the larvæ of other insects, which eggs when hatched develop into a devouring brood, which ungratefully turn upon and devour the helpless creature that sheltered them as a nest. The female ichneumon, having discovered a caterpillar or grub which her instinct informs her has not been previously attacked, at once proceeds to thrust her ovipositor into the writhing body of her victim, depositing one or more eggs, according to the size of the living food supply. When hatched, the larvæ devour and live upon their foster parent, avoiding in a marvelous way the vital parts of their victim, whose life is most accurately timed to last until its young tormentors are full grown, and not beyond. At one time we were led to believe in occasional instances of the instinct of female ichneumons being at fault, by observing them apparently ovipositing upon the dry shells of pupæ from which the butterflies had escaped. This, however, we subsequently found to be an erroneous idea, the fact of the matter being, that the caterpillar upon which the parent ichneumon had laid her fatal egg had had time, before the full development of the young ichneumon grub, to turn to the pupal stage. What, then, we saw was the young ichneumon fly just emerged from the dry pupal case, the contents of which it had first devoured in its own larval stage, then, itself turning to a pupa, it had lain, thus doubly incased, until, having broken forth a perfect fly, it rested upon its late prison, awaiting sufficient strength to come to its wings. What a wooden horse of Troy such a chrysalis would prove, if introduced into the breeding establishment of a collector!

Other members of the ichneumon tribe do not actually insert their eggs into the destined food supply of their young; but, as it were, going deeper into calculation of future events, content themselves with laying them in close proximity to the eggs of some member of the tribe upon which it is their mission to prey.

There is an old saying—

> Big fleas have little fleas
> Upon their backs to bite 'em;
> Little fleas have smaller fleas,
> So on *ad infinitum*,

which is very true, inasmuch as from the great humble bee down to the tiniest corn thrips—a mere speck of dust to the naked eye—all insects have their parasites, and generally their own special species of ichneumon, to prevent their over increase and to preserve the due balance of nature. There is a species of longicorn beetle found in Pennsylvania which feeds upon the tender bark of young hickory shoots. When laying time arrives, the female, having deposited her eggs in cavities perforated in the bark, carefully cuts a groove, about one-tenth of an inch wide and deep, round the shoot just below where her treasures lie. The object, or rather we suppose we ought to say the consequence, of this act is the withering and decay of the shoot, a provision for the sustenance of her young, which, when in their larval state, live upon dead wood! This remarkable insect is called the hickory girder from the above mentioned habit, which, we think, is one of the most extraordinary instances of foresight, through a mere blind instinct, that has ever come under observation.

The gadfly (*Œstrus equi*), whose larvæ are the bots which inhabit the intestines of the horse, gains for her progeny that comfortable position by entrapping the animal itself into introducing her eggs within its stomach. For this purpose, she lays her eggs upon such portions of the horse's body as he is in the habit of frequently licking, such as the knees, shoulders, etc. The unerring nature of her instinct is shown by the fact that she never chooses as a nidus any portion of the body which the horse is unable to reach with its tongue. Having thus been introduced into their natural feeding ground, the bots there pass their larval existence until, it becoming time for them to assume the pupal form, they go forth with the animal's dung to reach the earth, burrow into it, and therein pass the insects' purgatory.

Again, one of the grain moths (*Gelechia cerealella*) shows remarkable instinct in adapting itself to circumstances according to the time of year when it has to deposit its eggs. The first generation of these moths, emerging in May from pupæ which have lain in the granaries through the winter, lay their countless eggs upon the as yet ungathered corn, upon which their young play havoc until, having passed through the necessary stages, they come out in the autumn as the second generation amid the now stored up grain. Now, however, their instinct prompts them, not, like the first generation, to go forth to the fields to seek the proper nest and future nourishment of their young, but bids them deposit their eggs upon the store of wheat ready at hand. Thus, two following generations of the same insect are led by their instincts to different habits to suit the altered and, in the last case, unnatural position of their infants' destined food supply.

The interesting mason wasp, having with great care and skill bored out a cylindrical hole in some sunny sandbank, deposits at the bottom of this refuge her eggs. Next, provident mother as she is, she seeks out about a dozen small caterpillars, always of the same species, and immures them alive in the pit, as food for her cruel children. In making her selection of grubs to be thus buried alive, she rejects any that may not have reached maturity; not, we imagine, upon the score of their not being so full flavored, but because, when not full grown, they require food to keep them alive; whereas, when of mature age, they will live a long time without nourishment, ready to turn to chrysalides when opportunity occurs.

These are but a few of the instances which might be adduced in illustration of this foresight in insects, which compensates for their not being allowed in person to superintend the welfare of their offspring. In many cases, it would be better for human progeny were their parents thus endowed with an unerring instinct, rather than with an uncertain will.—*Chambers's Journal.*

The Real Paris.

Not long ago many visitors to Paris returned home full of enthusiasm for that beautiful city, and anxious to know why London, and New York, and Philadelphia and other great towns could not be made like the French capital. Now the French themselves are criticising the municipal administration of Paris, and from the account given of it in a recent number of their leading review, our people can get some useful hints. With a population approaching two millions and a half, less than a third are natives of the city, for it is a central point for skilled workmen and men of all pursuits from far and near. It has about 80,000 houses, with over a million separate apartments, of which two-thirds are used as dwellings and one-third for business; and of the former, three-fourths rent for less than a hundred dollars a year, housing one million of its working population. While London has more than three hundred building associations, with over a hundred thousand members, Paris owes its new houses mainly to large speculative corporations, which look more to their own profit, eked out by long terms of exemption from taxation, than to the health or comfort of the working men.

Even the important matter of public conveyances is left to great companies, and with their 9,000 cabs and 1,200 omnibuses and horse cars, and 13,000 private carriages, there is still complaint of a want of cheap and convenient means of transportation to the growing suburbs. The great omnibus company, in return for an exclusive privilege lasting until 1912, and at prices fixed by law, pays to the city half a million dollars annually. The gas and water companies are also private corporations, with long terms of exclusive right to supplying the city, and they pay over five millions of dollars annually into the city treasury. Water is scarce and gas is dear, as compared with supply and prices in other European capitals, but in spite of suits brought by the city the companies hold to the letter of their contracts, and refuse to meet the growing demand for a concession in the interest of the consumer.

Paris has a police force counting over 11,000 men in its service, and the annual arrests made average 40,000, of which number 20,000 are old offenders and 3,000 are strangers. The firemen number 1,700 men, costing $400,000 a year. Over 400,000 persons receive public assistance at a cost of nearly seven millions of dollars, and 125,000 poor are registered as entitled to alms, while 22,000 beds in the hospitals supply care for the sick and wounded. There are charity "homes" for old men and women, with room for 9,000 inmates, while for children over a million of dollars were spent in fighting the dreadful mortality that cuts off the future population in its infancy. Over five millions of dollars were spent in 1883 on education for a hundred and seventy thousand children in the public schools, while seventy thousand were in private schools, supported by subscription and taught mostly by clergymen and members of different religious orders.

The income and expenditures of the city of Paris in 1883 were over fifty millions of dollars, and of its receipts nearly thirty millions were produced by the tax called "Octroi"—the "King's eighth"—levied at the gates of Paris on all provisions that enter the city, thus adding to the cost of living. The largest item of expenditure was the interest on the municipal debt, and as that grows faster than the taxable value of property, now put at four hundred millions of dollars, and the indirect sources of income, the "Octroi" and the percentages of profits paid by the gas, water, and transportation monopolies, the future, with its growing needs for sewerage and drainage and the other recognized demands of better methods of making and keeping Paris healthy, is a matter of earnest discussion.

Much attention is paid to the numerous reforms proposed in this country and elsewhere for a change in existing municipal governments. In Paris there is a council elected by universal suffrage, but its action is largely subject to revision and veto by the Prefect, who is appointed by the general government, and hence a constant conflict, one party trying to make the local authority sovereign and independent, the other seeking to reduce it to a representation of taxpayers. The decision is still to be made; but it is of immense importance for the future of Paris, and it is of interest for all cities struggling to balance receipts and expenditures, and at the same time to meet the requirements of great and growing population crowded in the principal cities of both the old world and the new.—*Philadelphia Ledger.*

A Nocturnal Balloon Ascension.

On the 7th of August, Messrs Hervé and Alluard made a balloon ascension of so remarkable a character that it merits a description. The two aeronauts started upon their trip at midnight, from the Villette gas works at Paris, in a balloon of 1,200 cubic meters capacity. The car contained accumulators of electricity, which were constructed by Mr. Aboilard, and which supplied incandescent lamps whose light, concentrated by a powerful reflector, served for illuminating the maneuvers connected with starting, and allowed the aeronauts to read the instruments and maps with which they were provided.

The balloon slowly passed over Paris, throughout its whole extent, at the altitude of sixty meters only, lighted up the towers of Notre-Dame, crossed the Pantheon, and disappeared in the south. It landed the next day at Poisly, near Villermain (Loir-et-Cher), at one o'clock in the afternoon, after remaining in the atmosphere nearly thirteen hours. The route followed by the balloon, and carefully noted, is of genuine interest. After hovering in the bright moonlight over Sceaux and Limours, the travelers at five o'clock in the morning reached Arcemont, near Rambouillet. Here a strong current carried them along over Ablis, and then to the west toward Chartres. The landing occurred near the forest of Marchenoir. The anchor, which was of improved construction, caught without any trouble, and in a few minutes the balloon, owing to its large valve, was emptied of its gas.—*La Nature.*

The Addition of Blue to Collodion.

Herr G. P. A. Garjeanne, of Amersfoort, says he has found that the addition of a blue dye to collodion considerably increased its sensitiveness. He had a remainder of collodion prepared according to the following formula:

Ether	200 parts
Alcohol	200 "
Cotton	4 "
Iodide of ammonium	2 "
Iodide of cadmium	2 "
Bromide of cadmium	1 "

And a trace nitric acid.

The collodion had become a golden yellow, and was turning red; it worked slowly and hard. He stained it with Hofmann's violet BB (an aniline color), after which the negatives became much richer, and the sensitiveness was greatly increased. He then prepared another collodion:

Ether	200 parts.
Alcohol	200 "
Cotton	4 "
Iodide of cadmium	3 "
Pulverized bromide of potassium dissolved in a few drops of water	2 "

And stained it with methyl violet. With a poor single lens and this collodion he took photographs with an exposure of five seconds in the shade, and almost instantaneously in the full sunlight. He, therefore, asks whether greater sensitiveness could not be imparted to collodio-bromide of silver by using a blue stain?—*Archiv.*

The Largest Dredger.

The largest dredging machine in the world has been finished at Portrero Point, and will be used on the Sacramento and San Joaquin swamp lands. She has been named Thor, and modeled after the best dredges now in use by De Lesseps on the Isthmus Canal, cutting out a channel and building a levee at the same time. The Thor is 100 feet long and 61 feet wide, and has 34 iron buckets, with a capacity of 1½ cubic yards each, which can be filled and emptied fourteen times per minute. All the machinery was manufactured in San Francisco, and the timber is of Oregon pine.

A Gigantic Oil Well.

On Saturday, Oct. 11, the Christie Brothers' drilling well at Phillips City, Butler Co., Pa., struck the oil-bearing sand and began to flow at a tremendous rate, gushing forth the crude petroleum at the rate of 5,000 barrels per day, and the well will go down in history as being one of the largest wells ever struck in the oil region. The well is still producing at the rate of 180 barrels per hour. This well of Christie Brothers is only 365 feet from the famous Phillips well, which was struck Aug. 30, and is yet producing 2,200 barrels per day. These great wells have paralyzed the oil trade, and the oil market has sagged from 75 cents to 62 cents per barrel.

The Art of Prolonging Life

The possibility of prolonging human life has undoubtedly, from the most ancient times, afforded a fascinating and extensive field alike for the visionary and the deepest thinkers. Plans for prolonging existence have ever been among the principal allurements held forth by empirics and impostors; and by thus imposing upon the credulity of the public, many notorious charlatans have acquired rich harvests of ill-gotten gold. Men of science have throughout all ages devoted their attention to the subject, as one deserving of the most profound investigation. And their researches have been attended with more or less benefit to posterity. We find that Bacon himself attached so much importance to the matter that he prosecuted inquiry in that direction with the utmost assiduity. Although it would be almost impossible to review all the schemes advanced, yet a review of the most notable theories advocated for prolongation of life is certainly deserving of attention. At the same time, an elucidation of their fallacies, as occasion may arise, is of no small moment, in order to ascertain with greater certainty their true value. It is indeed interesting to observe the various and often opposite means advocated by enthusiasts for attaining the same end.

Even as far back as the Egyptian, Greek, and Roman periods, we find the idea of prolonging life prevalent. The Egyptians bestowed considerable attention to the attainment of longevity, and they believed that life could be prolonged through the efficacy of sudorifics and emetics continually used. Instead of saying, "How do you do?" as an ordinary salutation, they inquired of each other, "How do you perspire?" In those days, it was a general custom to take at least two emetics during each month. Hippocrates and his disciples recommended moderation in diet, friction, and well timed exercise, which was certainly a step in the right direction.

It was during the darkness of the middle ages, ripe with fanaticism and superstition, that the most absurd ideas of witchcraft, horoscopes, chiromancy, and empirical panaceas for the prolongation of life first became disseminated. The philosopher's stone and elixir of life were then vaunted by the alchemists. Foremost among the prolongers of life we find Paracelsus, an alchemist of great renown, and a man of considerable attainments. He claimed to have discovered the elixir of life. So great was his influence, that even the learned Erasmus did not disdain to consult him. Patients and pupils flocked around him from every quarter of Europe. Notwithstanding his famous "stone of immortality," he died at the age of fifty. His vaunted elixir was a kind of sulphur similar to compound sulphuric ether. Nevertheless, to the researches of Paracelsus we are indebted for our primary knowlege of mercury, which he was the first to use as a medicine.

About this epoch, one Leonard Thurneysser attained worldwide celebrity as an astrologer and nativity caster. He was a physician, printer, bookseller, and horoscopist all in one. He professed that, by the aid of astrology, he could not only predict future events, but likewise prolong life. He published yearly an astrological calendar, describing the nature of the forthcoming year and its chief events. His calendar and other quackeries enabled him to amass the sum of one thousand florins. He declared that every man lay under the influence of a certain star, by which his destiny was ruled. On ascertaining from what planet a person's misfortunes or sickness proceeded, he advised his patient to remove his residence within the control of a more propitious luminary. In short, to escape from the influence of a malignant to a more friendly satellite was the basis of his theory.

Marsilius Ficinus, in his *Treatise on the Prolongation of Life*, recommended all prudent persons to consult an astrologer every seven years, thereby to avoid any danger which might threaten them. During the year 1470, an individual named Pansa dedicated to the Council of Leipzig a book entitled *The Prolongation of Life*, in which he most strongly urges all persons desirous of longevity to be on their guard every seven years, because Saturn, a hostile planet, ruled at these periods. According to the teachings of astrology, metals were believed to be in intimate connection with the planets. Thus no doubt it was that amulets and talismans originated, as reputed agents for prolonging life. The disciples of this creed had amulets and talismans cast of the proper metal, and under the influence of certain constellations, in order to protect themselves from the evil influence of adverse planets. These absurd conceits were at a later period revived by Cagliostro, of whom we shall have more to say presently. It would indeed appear that the more mysterious and ridiculous the conceptions of fanatics and impostors were, the greater was their success.

The example of the renowned Cornaro affords a brilliant instance of the superiority of an abstemious life to the foolish doctrines put forth at that period. Up to forty years of age he was excessively intemperate both in eating and drinking, so that his health suffered considerably. He then resolved to submit himself to a strictly temperate regimen, and for the remaining sixty years of his life, which almost reached one hundred years, he continued the observance of his rules, with the result given. Although life might be prolonged by exercising greater moderation in eating and drinking than is generally adopted, yet, nevertheless, few persons could safely follow so strict a dietary.

Shortly after the death of Louis XIII. of France, who was bled forty-seven times during the last ten months of existence, a contrary method came into fashion. Transfusion was for a time relied upon as a means for invigorating and prolonging life. The operation was performed by aid of a small pipe conveying blood from the artery of one person to another. In Paris, Drs. Dennis and Riva were enabled to cure a young man who had previously been treated in vain for lethargy. Further experiments not being so satisfactory, this device as a prolonger of life became discarded.

Francis Bacon held somewhat unique ideas regarding the possible prolongation of existence. He regarded life as a flame continually being consumed by the surrounding atmosphere, and he thence concluded that, by retarding vital waste and renewing the bodily powers from time to time, life might be lengthened. With the object of preventing undue external vital waste, he advised cold bathing, followed by friction. Tranquillity of mind, cooling food, with the use of opiates, he advocated as the most suitable measures for lessening internal consumption. Furthermore, he proposed to renovate life periodically, first by a spare diet combined with cathartics, subsequently through choice of a refreshing and succulent diet. With some degree of modification, there seems to be much wisdom in his views, excepting as regards the opiates, which are decidedly of a prejudicial nature.

Numerous charlatans have appeared, and still appear at intervals, loud in their asseverations of having discovered the veritable elixir of life—gold, tinctures, and many other nostrums with which they mendaciously promise to prolong life. The most notorious of these empirics was the Count de St. Germain, who with barefaced effrontery protested that he had already existed for centuries by aid of his "Tea of Long Life," which he declared would rejuvenate mankind. On close examination, his miraculous philter was ascertained to consist of a simple infusion of sandal wood, fennel, and senna leaves.

A great stir was created in 1785, by the occult pretensions of a fanatical physician in France named Mesmer. He vaunted the possession of extraordinary magnetic power, which enabled him forthwith, by its agency, to remove every disease and prolong life. At the king's desire, a commission was instituted to report upon this phenomenon, in which Dr. Franklin took a leading part. The only practical result of this inquiry was the discovery of animal electricity. At one time, Mesmer refused three hundred and forty thousand livres for his secret. After Dr. Franklin's investigations, Mesmer lapsed into obscurity.

Last, but not least in the foremost rank of impostors, was Joseph Balsamo, alias Count de Cagliostro. This charlatan appeared just before the first French Revolution. During his remarkable career, Cagliostro made more than one fortune, which he subsequently lost, and died in prison in 1795. The distinguished Cardinal de Rohan was one of his chief dupes. Like St. Germain, Balsamo boasted that he had discovered the elixir of life, and throughout Europe found persons of all degrees eager to possess his panacea. This elixir was a very powerful stomachic, possessed of great stimulating properties, tending to augment vital sensations. It is a fixed law of nature that everything which increases the vital forces tends to abridge their duration. Concentrated and potent stimulants, which are usually the active principle of most elixirs, although for the time increasing strength, are in truth very prejudicial to longevity.

We will now pass on to examine other theories more worthy of attention, before we proceed to establish what at present appears to be the most certain means for promoting longevity. The plan of "hardening"—based upon a false supposition that by toughening the physical organs they would wear longer—obtained at one time numerous followers. When we reflect that the main principle of life depends upon the pliability of every organ, combined with free circulation, it naturally follows that rigidity must be unfriendly to longevity. Perpetual cold baths, exposure to keen air, and exhausting exercise were advocated by the "hardening school." Like most enthusiasts, they carried their ideas to excess, a limited use of which would have been beneficial. Later on, a theory well suited to the idle and luxurious gained many adherents, namely, to retard bodily waste by a trance-like sleep. One enthusiast, Maupertuis, went so far as to propound the possibility of completely suspending vital activity. Even Dr. Franklin, having observed the restoration of apparently dead flies by exposure to warmth, was struck with the feasibility of promoting long life by the agency of immobility. The misconception of this theory, from a physiological point of view, is at once self-evident, as want of exercise is simply poisonous to health. Upon a constant metamorphosis of the tissues, physical well-being must depend to a great extent. A destructive plethora would most certainly be induced by attempting "vital suspension."

That celebrated sect of mystical philosophers, the Rosicrucians—famous for their profound acquaintance with natural phenomena and the higher branches of physical, chemical, and medical science—considered that human existence might be protracted far beyond its supposed limits. They professed to retard old age by means of certain medicaments, whose action upon the system should curb the progress of natural decay. The means by which they professed to check senile decrepitude were, like other mysteries of their fraternity, never revealed. The celebrated English Rosicrucian Dr. Fludd, whose writings became famous, is said to have lived a century.

The principal disadvantage of the various plans which have been set forth for promoting longevity appears to be that they are all deficient in this important respect—that they only regard *one object and neglect the rest*. However beneficial any theory may prove, it must be materially inadequate in fulfilling its purpose, should numerous other matters of the greatest importance bearing upon the human economy be ignored. Hufeland, in his luminous work, "The Art of Prolonging Life," is of opinion that the real art of longevity consists in cultivating those agents which protract existence, and by avoiding all circumstances tending to shorten its duration. This is undoubtedly the most reasonable method for obtaining the end in view. Moderation in all things (avoiding as far as possible every morbific condition), and open air exercise, are far more reliable means of prolonging life than any of the elixirs and panaceas ever advocated. Finally, health and longevity can only be attained by an intimate acquaintance with and obedience to those natural laws which govern our physical economy.—*Chambers's Journal.*

Cause and Prevention of Forest Fires.

This is the season for forest fires, and in many parts of the country we hear of great destruction already from burnt fields and forests. The New Bedford *Evening Standard* in an article on the subject concludes that the most frequent cause for such fires is from careless tourists and sportsmen, who on leaving a camp, to make sure that the fire is put out, will kick the embers about, thinking that by thus separating the half burnt brands the fire will soon go out. So they will, perhaps, nine times out of ten; but the tenth time a whirling gust of wind may carry a spark or coal where it will kindle a blaze, or one of the brands may have some soft, punky place in it where the fire will nestle for days, and bide its time. But old backwoodsmen, the writer thinks, are not so apt to take things for granted.

In northern Maine and New Hampshire, he said, tourists would throw away cigar stumps. The backwoodsmen can't afford cigars, and as a rule smoke their pipes out, because they don't find tobacco or the money to pay for it very abundant.

Before breech loaders or cut wads became so common, many bad fires were started from gun wads made of loose paper. The cut wads now used do not hold fire long. Of course, with metal cartridges there is no danger.

Locomotive sparks are a very frequent cause when a railroad runs through a large forest. In planning preventive legislation, it might be well to inquire whether railroads running through such regions should not be required during certain months of the year to keep a section force larger than mere track repair would require. Either this or carrying spark arresters on every locomotive seems to be demanded by the public welfare.

Few people realize how serious a calamity these fires have become. Already in the most thickly settled parts of the country good working wood is becoming scarce and high, although there is often a glut of inferior grades, and therefore very low prices for them. The correspondents of the lumber journals report from almost all quarters that the demand for really good material is generally in excess of the supply. The only hope for the future lies in economy of what we have, and in whatever will encourage those owning young timber to keep it and prune it and thin it out so as to bring it on to fill up the gap. But forest fires destroy an amazing amount of the precious mature stock—how much no one knows—but it is said by experts that the amount destroyed probably equals the amount cut. Now, we know that the sawed stuff (to say nothing of fuel and charcoal, ties, telegraph, and hop poles, etc.) reaches an annual value of over $230,000,000 at the mills, so that, counting other forest products besides sawed stuff thus destroyed, it is, no doubt, within reason to say this waste, largely needless, is not less than $300,000,000 a year. But this is not all, and very likely it is not the worst. Such fires burn up a great amount of young growth and of seed, and in some cases even the soil itself is roasted to death, so that for a long time afterward it will not bear anything of value.

Cure for Sciatica.

A remedial agency not commonly resorted to has been recently brought under notice by M. Debove for the relief of neuralgic sciatica. This physician seems to have met with considerable success in the treatment of sciatica by freezing the skin. Richardson's ether spray not proving satisfactory, M. Debove employed the chloride of methyl, which may give rise to a degree of cold represented by —23° C. This agent has the advantage of not being expensive. A jet of the fluid is made to play on the skin along the whole length of the limb corresponding to the course of the sciatic nerve and its main branches. The good effects are said to be instantaneous. The operation is also claimed to be but little painful; the smarting is not so great as that caused by the hot iron. Vesication has followed the employment of this remedy, but never any sloughing. The extension of this measure to other neuralgiæ is advocated.—*Lancet.*

The Quickest Time between Philadelphia and Jersey City.

Mr. Wm. Barnet Le Van informs us that the quickest time ever made between Philadelphia and Jersey City was made by locomotive "5000," the five thousandth built by the Baldwin Locomotive Works, on May 14, 1880, over the Bound Brook route.

Distance	89·4 miles.
Time	98 minutes.

The weight of the train complete was 148 tons. The return trip was made in 100 minutes.

The Efficiency of a Boiler.

BY DR. H. A. MOTT.

As the amount of water converted into steam, required per horse power for high pressure engines and low pressure condensing engines differs materially, as also differs with the particular make of engine, it is best, to avoid confusion in results, to estimate the efficiency of a boiler by the actual amount of water evaporated by one pound of the combustible portion of the coal from and at 212° F. into steam free from entrained water.

Again, to theoretically deduce the greatest amount of water which can be evaporated by one pound of coal, it is best to figure on the basis of pure carbon, as all coal contains a variable amount of ash, and in ordinary boilers forms a varying amount of clinkers, and also all coal contains small percentages of other elements which increase more or less their efficiency.

Adopting, then, pure carbon as a basis for figuring, then any result may be modified according to the composition of the fuel used in any particular experiment.

It is true that certain standards have been adopted from time to time to represent a horse power, as for example, Nystrom states that the evaporation of 39,607 pounds of water per hour from 32° F. to 70 pounds pressure is equal to one horse power.

While Mr. Emery, probably the highest authority on steam engineering in this country, fixed at the last Centennial Exhibition the following as a standard: The evaporation of 30 pounds of water from a temperature of the feed 100° F. to 70 pounds pressure equals one horse power; others have substituted 212° for 100° F. Some of the best engines take very much less water to the horse power, while some inferior engines require twice the amount.

If the amount of water which can be evaporated from and at 212° F. from one pound of combustible matter is known, then any formula which is correct for any particular engine can be adopted to ascertain the horse power.

While the amount necessary to produce a horse power varies with the engine employed, still a horse power is a fixed amount of work, and is the amount of energy required to lift 33,000 pounds through one foot in one minute, or 1,980,000 pounds through one foot in one hour.

How much horse power, then, can theoretically be obtained from one pound of pure carbon?

The complete combustion of one pound of carbon generates sufficient energy to lift 10,808,000 pounds one foot in one minute.

Therefore, if 10,808,000 is divided by 33,000, the result—327·5—will represent the horse power generated in one minute; and if this result be divided by 60 (minutes), the result will be 5·44 horse power, which represents the total theoretical horse power generated by the combustion of one pound of carbon for one hour. The 10,808,000 foot pounds is obtained by multiplying the heat units of carbon, which are 14,500, by the mechanical equivalent of heat—772 foot pounds.

While one pound of carbon by its complete combustion can generate (theoretically) 5·44 horse power for one hour, it is unfortunate that no engine has yet been devised to practically utilize the heat of combustion *directly*, and not through some other agent, as water or bisulphide of carbon. When water is used as a medium to convey the heat, a boiler has to be employed.

Under this condition, if all the heat of the combustion of one pound of carbon were communicated to the water, and none lost, then one pound of carbon would theoretically convert 15 pounds of water at 212° F. into steam of 212° F. This is deduced by dividing the total heat units of coal—14,500—by 966, the number of heat units rendered latent when one pound of water passes into steam.

If, then, one pound of carbon will convert 15 pounds of water at 212° into steam at 212° F., then it will convert 12·2 pounds of water from a temperature of 100° F. into steam of 70 pounds pressure. Using Emery's formula for a horse power, then one pound of carbon will theoretically produce 0·465 horse power, or 2·46 pounds will produce one horse power.

Such a result, however, never could be obtained practically, for no allowance is made for loss of heat by imperfect combustion, radiation, and the heat necessary to escape up a chimney to produce a chimney draught, etc.

As a result of thirty tests conducted by Mr. Emery at the Centennial, the highest result obtained from the combustible matter in anthracite coal was the production of one horse power with 2·85 pounds of coal combustible, or from 3·18 pounds of coal, the poorest result obtained was the production of one horse power with 4·10 pounds of combustible matter, or 4·44 pounds of coal. In the first instance the evaporation per pound of combustible from and at 212° was 12,094 pounds of water, or 10·52 pounds from 100° to 70 pounds pressure; in the second, the result was 8·397 pounds and 7·304 pounds.

The first result shows a utilization of over 86 per cent of the combustible matter, assuming it to be about the same as pure carbon. An actual test made at Lynn, Mass., showed that at the pumping works the boilers only returned 66 per cent of the fuel as steam, and only 10 per cent (in round numbers) of the total energy of the fuel was contributed to the working force of the engine. *The great loss, then, of the heat units in coal is not so much in the boiler as in the engine*, as a first class boiler will *not lose over 15 per cent* of the theoretical amount. While there is a chance for some improvement in boilers, it is insignificant compared to the improvement which should be made in steam engines. Considerable improvement has been made in the latter, as, for example, a first class slide valve engine requires 45 pounds of water per horse power, while a Harris-Corliss engine only requires 25 pounds of water, and in the Harris-Corliss condensing engine, according to actual test, one horse power is produced with 1·8328 pounds combustible (Wilmington coal), and with the utilization of 16·156 pounds of water per indicated horse power (actual) at a temperature of feed 114·34° to 92·876 pounds pressure, the boilers evaporating 9·639 pounds of water from and at 212° F. by one pound of coal, or 10·31 pounds of water per pound of combustible.

To estimate the efficiency of a boiler, the engine must be left out of consideration, as the quantity of water required per horse power has been shown to be variable, and depending on the kind and make of the same.

The amount of water converted into steam from 212° to 212° F. is the most reliable means of determining the efficiency of a boiler; then all boilers can be compared on the same basis. If the standard for a horse power fixed by Emery be adopted, then all boilers can be compared on this basis, which will give the correct result for engines conforming with the standard, but which result must be altered to conform with engines requiring different standards.

The question was asked me, Can 700 horse power be produced *for ten hours* from *two tons* of *coal*, and if not, what is the greatest theoretical amount of horse power that can be obtained for ten hours from the same quantity of coal? Assuming the coal to be pure carbon, then two tons, or 4,000 pounds, in ten hours would be 400 pounds per hour. The theoretical evaporation given above for pure carbon was 12·2 pounds of water from 100° F. to 70 pounds pressure. Adopting Emery's standard for a horse power, then 400 pounds of coal (pure carbon) would theoretically produce 162·66 horse power per hour, and with two tons the same horse power for ten hours, or 700 horse power *for only* 2 *hours and* 19 *minutes*+, instead of for *ten hours*. The least theoretical amount of coal (pure carbon) that would produce 700 horse power for ten hours would be 8·6 tons. Of course such an economical result could never be obtained practically. As all coal contains inorganic salts (ashes), heat is lost by radiation, and heat of necessity is lost with the escaping gases up the chimney. If 700 horse power should be practically produced from ten tons of coal, the result would be excellent.

Delays in the Patent Office.

We are in receipt of complaints from inventors and manufacturers of machinery because of the delay to which they are subjected in obtaining patent papers from the Patent Office in Washington. As a rule, an inventor cannot receive the adjustment of his claim in less than eight or nine months, and often the period is much further prolonged. One of the results of this is that serious injury is inflicted upon persons who desire to patent articles which are of temporary utility, and which cannot be marketed to advantage unless they can be offered for sale at once. The number of such articles for which patents are desired is by no means small, and the failure of the Government to grant patents promptly simply has the effect to rob the inventions of the whole of their value. These are the extreme cases. Not so much harm is done by delay in the cases of inventions which are of permanent usefulness; but even in these there are vexation, annoyance, and loss, for which no reasonable excuse can be offered, and to which no inventor should be subjected. The policy of our Government, based upon wise considerations, has always been to encourage invention by dealing liberally with inventors; and to this policy we may attribute much of the huge industrial advancement which has characterized the first century of our national existence. Any creation of obstacles to profitable invention would be a most grievous blunder, but the harassing delay now involved in the practice of the Patent Office is an obstacle of a very serious character.

There can be no difficulty in discovering the reason for this procrastination. The Patent Office simply has more work to do than can be done properly by its present clerical force. The number of applications now made every day is about 125. This is about twice the quantity that was offered a few years ago; but, while the population and the inventive effort of the country have largely increased, the force in the Patent Office remains as it was a score of years since. The Commissioner has attempted to bring some relief to applicants by taking up, out of their regular order, the inventions which seemed to him to be of most pressing importance; but this, of course, has worked injustice to the mass of applicants, and it has now been formally abandoned. The Commissioner declares that he can make no expedition of procedure until Congress shall give him more money and more men; and so the blame for the whole difficulty comes back to Congress, and the remedy can be applied only by Congress.

It is always a hard thing to impress upon the average Representative the importance of reforming anything in which he is not directly interested as touching the needs of a large mass of his constituents. The ordinary Congressman is either a lawyer or a professional politician, and, as he has no interest in machinery, he is apt to regard inventors and inventions with nearly complete indifference. At the end of a session, he will vote to cut down every appropriation which he thinks does not concern him, so that he can increase every appropriation which will help him in his district. The way to enforce the attention of Congress to the needs of the Patent Office, and of the machinery builders, is for every man in the country who is in any way interested in machinery to write to his Representative, stating the case and demanding redress. The appeals of the Commissioner of Patents have been made in strong terms, and they have uniformly been disregarded; the average Congressman cares nothing for demands from that quarter. What is required is the active interposition of the voters in the districts. The fees demanded of patentees are large enough to secure good and prompt service from the Patent Office, and such service is not only the right of individual inventors, but of the nation which profits so much from their ingenuity.—*Textile Record.*

Insurance Risks in Inebriety.

The well-known fact that life insurance companies find excessive mortality in their risks in certain sections of the South and Southwest has been the subject of some interest lately. Several of the Hartford companies who have examined the facts have found that this mortality came directly from inebriety, and was due to the liberal interpretation of the agents, who did not realize that any risk of inebriety was perilous unless the insured had suffered from delirium tremens many times. No use of alcohol, either moderate or occasionally immoderate, was thought to be dangerous.

The agents and examiners had no clear conception of the danger of alcohol, and treated the companies' views as extreme. The result was that special examiners were sent from the home office to cancel all the risks of ten thousand and upward where the insured were found using alcohol to any excess. Finally some of the companies withdrew their agents altogether, and do not solicit business in certain sections. In one case twenty-eight deaths were all traced to the excessive use of alcohol, and were all paid, simply because it was cheaper to settle than to contest. At a recent meeting of the Tennessee State Board of Health, the Secretary reported that a Hartford life insurance company had ordered its agents not to issue any policies in six counties of the State, owing to the excessive mortality of the policy-holders. The question came up of the cause of this mortality; as no reports indicated any special disease in this section, a letter was addressed to the secretary of the company to know the reason.

The answer was that from the amount of insured lives in these counties, the average loss to the company should be about sixty-eight thousand dollars, when in fact it was over one hundred and fifty thousand dollars—more than double the loss of any other section, and that without any special cause of epidemic disease.

The real explanation was the want of care in taking risks and the number of inebriates who had been taken as proper cases. It is the same old blunder of supposing inebriety to be a mere vice at the control of the victim, and in no way periling life unless used to great extremes.—*Jour. of Inebriety.*

Electric Light at Hell Gate.

On Monday evening, October 20, the electric lights in the new lighthouse at Hell Gate were turned on for the first time, and the result was very satisfactory. Every outline of the shore could be distinctly seen, and the water sparkled as the light jumped and flashed from wave to wave in the rapid current. Hereafter the fleet of vessels which come down the river each morning in the dark will be able to pass the most dangerous parts of Hell Gate without waiting, as heretofore, for the sun to rise and light up the rocks that make the passage so perilous. The tower consists of four iron columns placed so as to form a pyramid cut off at the top. The columns are 54 feet apart at the base and 5 feet apart at the extreme top. The columns are joined together by iron work, and each is anchored at the base to a block of concrete 9 feet square at the bottom and 10 feet high. The electricity is supplied to the lamps by a No. 8 Brush machine, running nine lamps of 6,000 candles each—a total of 54,000 candles. The lamps are arranged to form three-quarters of a circle.

All the electric machinery in the tower is to be duplicated, so in case of accident the light would not fail. In the SCIENTIFIC AMERICAN of March 24 was published a full description of this new lighthouse, with drawings and diagrams illustrating its construction.

Domestic Pond Lilies.

At the New York State Experiment Station there is a barrel cut down to convenient size, and then set in a hole dug in the earth upon a corner of the lawn. The top of the barrel is just level with the surface of the lawn. It has about four inches of river mud in the bottom, in which were planted a few roots of the common white pond lily. The barrel was then filled with water, and is kept full from a faucet in the aqueduct pipe, the water being turned on as often as necessary. The barrel has been a beautiful miniature pond of white lilies all through the season. In the fall, after the weather gets cold, the barrel or tub is lifted out and carried to the cellar, where it is protected from freezing, and where the roots of the lilies will be kept in conditions similar to what they would be surrounded with in their natural state. Nothing can be more charming in the way of flowers on a lawn than a small pond of water lilies blooming daily the whole summer through. Of course the barrel must be set where teams and persons would not walk into it by night or day. If the tub is a tight one, the trouble of keeping it supplied with water will not be great upon any lawn.—*N. E. Farmer.*