DE SUSINI'S ETHER MOTOR.

We were the first (it is now more than a year ago) of the scientific press to call the attention of the industrial world to the ether motor of Dr. Paul de Susini. Certainly, at that epoch, the application made by the inventor of his idea of substituting the vapor of ether for steam presented those imperfections and complications that are inevitable in the putting of an invention in practice, but it appeared none the less certain that it was in this direction that it was necessary to seek the solution of the problem that all mechanicians are pursuing, *i. e.*, the improvement of the steam motor from the standpoint of saving in water and coal—a problem whose importance is increasing every day by reason of the progressive augmentation of the cost of fuel. In fact, the efforts made in this direction with steam engines, and which have had for effect the creation of triple and quadruple expansion engines, have indeed permitted of effecting considerable saving in expense as compared with the old motors, and of reducing, for example, the consumption of coal from 4 and 3 kilogrammes to 1·5 and 1 kilogramme, and even, in exceptional cases, to 750 grammes per horse and per hour. These were very satisfactory results twenty years ago, but these figures, which represent the minimum of expense that can be laid claim to with the steam engine, are still much too high in the present economic conditions.

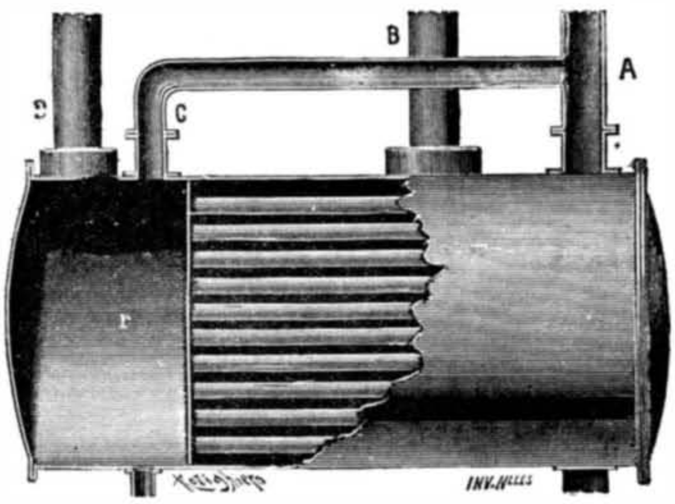

Fig. 1.—CONDENSO-GENERATOR.

Convinced of the impossibility of remedying this state of things, a certain number of mechanicians devoted themselves to the study of the gas motor, which, in recent years, has come into so extensive use, and they soon recognized the fact that the addition of a gasometer for furnishing the gas necessary for the working permitted of reducing the cost of coal per horse and per hour to the neighborhood of 600 grammes. But here again it was found that a limit had been reached that one could not think of going beyond. And yet in these two cases the calculations of thermodynamics establish in the most express manner that a feeble part only of the heat units produced by the combustion of the coal is converted into effective power. The heat lost is absorbed in great part, when it is a question of the steam engine, by the conversion of water into steam. This is what is called the latent heat of vaporization. In the case of the gas motor this heat is utilized both in consequence of the insufficiency of the expansion and of the high temperature (about 300°) of the gases on their exit from the cylinder.

In order to obtain a better utilization of the heat units produced by the combustion of the coal, it was therefore necessary to seek a liquid which should require a less quantity of heat than water does for its conversion into vapor, and which, under the latter state, might furnish the same sum of work in giving the same advantages as regards expansion, and which, after its passage to the cylinder, should be easy to bring back to a liquid state, in order to rebegin the same cycle indefinitely. Of all known materials, that which best satisfies such conditions is sulphuric ether, which boils at 35° and the vapor of which at 95° has a tension of six atmospheres, while steam has none at this temperature. Many inventors before Dr. De Susini had seen the advantages that might be derived from the use of the vapor of ether for actuating the piston of an engine, but none had succeeded in carrying out the idea in a practical manner.

The difficulties met with are numerous: leakages of vapor, involving considerable losses of a very costly liquid; difficulty of keeping the cylinder at a temperature sufficient to prevent the condensation of the vapor before it has produced its entire useful effect; dangers of explosion of the generator, due to the fact that the least elevation of the temperature immediately results in a considerable increase of the pressure of the vapor, etc. Dr. De Susini has surmounted all these difficulties, after numerous experiments that lasted for several years, and during which he gave proof of those qualities of perseverance and energy that are the characteristics of the true inventor. It must be added that he was valiantly sustained in this everyday contest by Mr. Digeon, the inventor who had undertaken the construction of the motor.

In order to get an idea of the multiple phases through which the putting in practice of Dr. De Susini's invention has passed, it will suffice for our readers to refer to the figures of the motor of a year ago that we published in our number of October 5, 1891.* This engine, which was itself only the resultant of numerous anterior tentatives, was evidently much too complicated for an industrial motor. It consisted essentially of four simple-acting cylinders coupled in pairs and inclosed in a cast iron chest filled with glycerine. Beneath this chest were arranged two cylinders, one above the other, containing water and heated by a furnace situated beneath the lower cylinder. This latter was traversed throughout its entire length by two tubes connected by a series of bent tubes and containing ether. These, as a whole, constituted the vapor generator.

* SCIENTIFIC AMERICAN SUPPLEMENT, No. 828, p. 13223.

In the upper cylinder were hung a large number of vertical tubes ending at the base of the chest containing the glycerine. The latter was heated in these tubes and rose to the upper part, where it replaced that already cooled, which descended to the bottom. Finally, the two cylinders were connected by two tubulures so as to constitute a water thermo-siphon, which heated the glycerine thermo-siphon constituted by the vertical tubes and the chest. One had therefore a continuous circulation of the two liquids, and it was possible to keep the temperature of the whole nearly constant—an important point, as we have before said.

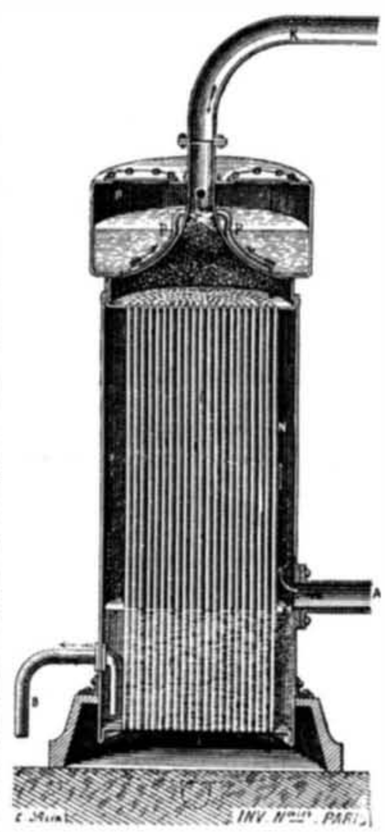

Fig. 2.—AERO-CONDENSER.

On making its exit from the cylinders, the ether vapor went to an aero-condenser, which is the sole part of the old motor that we find in the new, and which it is therefore well to describe again in this place. It consists of a number of vertical tubes, J (Fig. 2) inclosed in a jacket and debouching at their two extremities in two chambers, K and L. The upper chamber receives the conduit, *k*, of a blower moved by the engine. The lower chamber receives the exhaust pipe of the projected air that has traversed all the tubes. This conduit is figured in dotted lines at the base of the apparatus.

The ether enters the cylinder, N, through the pipe, A, and becomes condensed in contact with the tubes cooled by the current of air, which is moistened by means of a spray of water at O, due to the meeting of small convergent jets issuing from a series of capillary tubes, *p*. A reservoir, P, contains the water for supplying these tubes, and it is the pressure of the current of air coming from the blower and entering the reser-

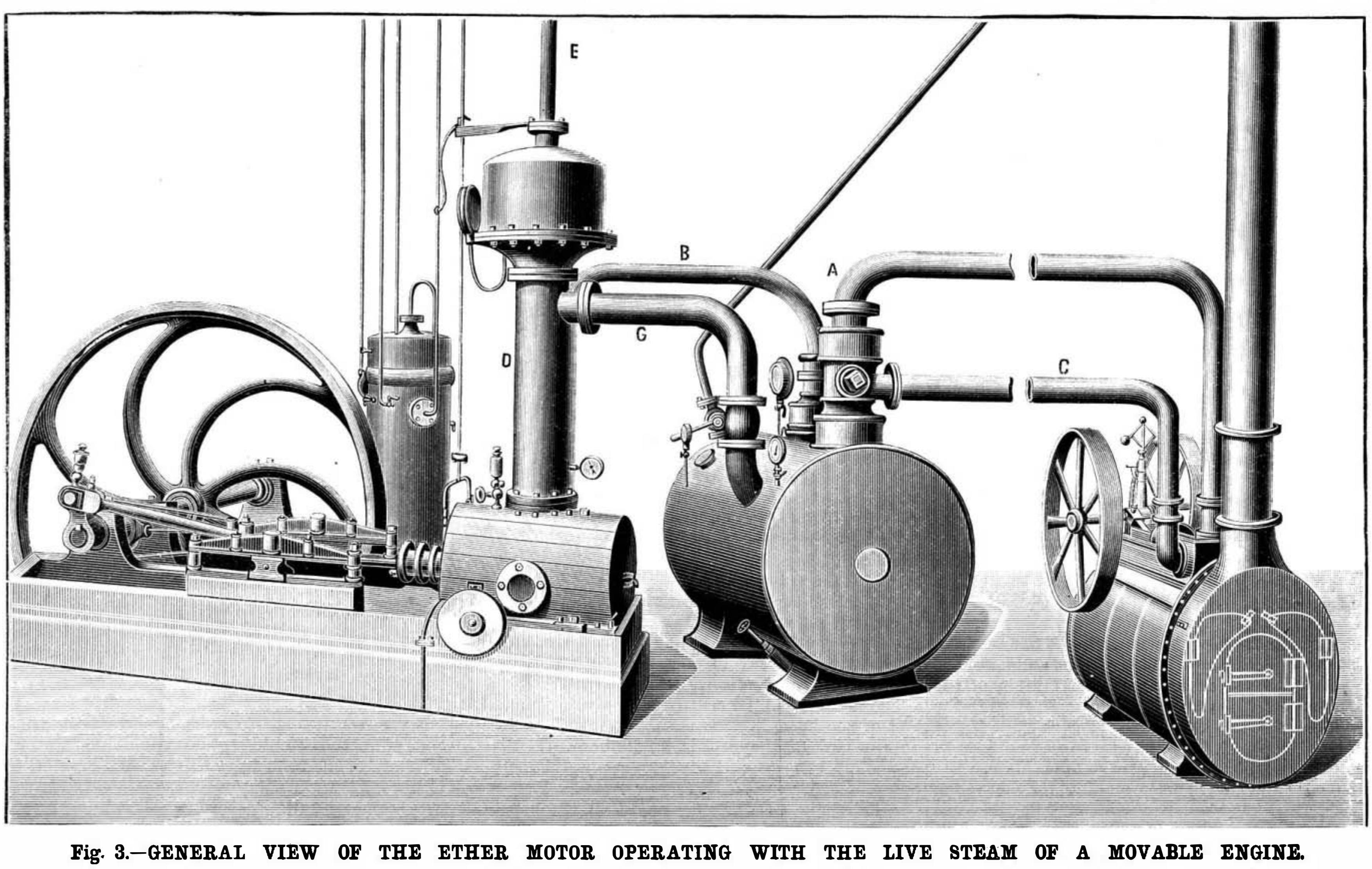

Fig. 3.—GENERAL VIEW OF THE ETHER MOTOR OPERATING WITH THE LIVE STEAM OF A MOVABLE ENGINE.

voir through the apertures, *q*, that causes the water to rise in the tubes, *p*, and makes it spurt in convergent jets which come into collision at O. The atomized water is drawn into the tubes, J, by the current of air and thus notably augments its refrigerant power. The condensed ether collects at the lower part of the cylinder, N, and flows through the tube, B, to return to the generator, thus forming a complete cycle, and, so to speak, an indefinite one.

The new machine, represented in Fig. 3, solves in an absolutely practical manner all the conditions already indicated for the perfect working of a motor of this kind. As may be seen, it has the form of an ordinary steam engine, and it differs therefrom in reality only by the arrangement of the steam jacket, stuffing box, valve rods and piston. The generator of ether vapor (Fig. 1) is an ordinary surface condenser filled with ether, and in the tubes of which circulates the steam derived from a boiler. In the present case, the generator is that of an Olry & Grandemange movable steam engine of five horse power, arranged in a basement in the vicinity of the room containing the ether motor, but that we have supposed on the same level in the engraving.

The operation comprises two complete cycles; one for the steam which starts from the boiler through the pipe, A, and enters the tubes of the aero-condenser, where it gives up its heat to the ether, condenses and returns to the boiler through the lower pipe; and the other the cycle of the ether vapor, which starts from the condenso-generator through the pipe, B, goes to the motor, makes its exit therefrom after having worked, goes to the aero-condenser (not figured in the engraving), and returns in a liquid state to the reservoir, R, whence a pump forces it into the condenso-generator.

As may be seen, there could be nothing simpler than this installation. The only places where it could be possible for leakages of ether to occur are the two stuffing boxes of the valve rods of the piston. In order to render them absolutely impermeable, the stuffing boxes have been arranged as in Fig. 4. They are, in reality, each composed of two stuffing boxes (the external one is not represented in the figure) separated by bronze washers, between which is arranged the packing.

The tightening of the external stuffing box, therefore, produces that of the entire system. The lubrication is produced by the glycerine contained in the external annular space, and which is capable of penetrating freely all around the shaft through apertures formed in the body of the stuffing box. The vapors of ether that may have entered the intervals between the washers cannot escape laterally, by reason of the great difference between the density of the ether and glycerine. They rise, therefore, to the upper part of the annular space, whence a copper tube leads them to the receptacle, R.

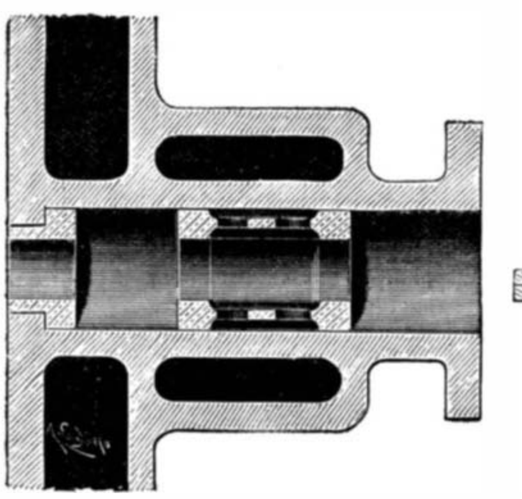

Fig. 4.—DETAILS OF THE STUFFING BOX.

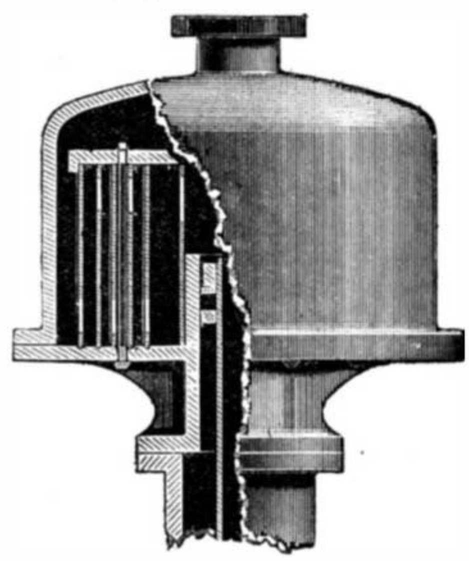

Fig. 5.—HALF ELEVATION AND SECTION OF THE SEPARATOR.

The steam issuing from the cylinder rises through the pipe, D, to flow to the condenser, which, as we have said, is not represented in Fig. 3. In its course it traverses a separator (Fig. 5) composed of plates, each containing an aperture, now at the upper and now at the lower part. In this passage the steam is entirely freed from the traces of glycerine that it may have carried along and reaches the aero-condenser perfectly pure, while the glycerine falls back into the valve box.

In the engine under consideration, which is a model of demonstration, the steam may be taken directly from the boiler or at the exhaust after working in the movable engine. In both cases the cycle is the same, but the installation is a little more complicated by the pipes that it is necessary to add to lead the steam coming from the exhaust into the condenso-generator in passing through the steam jacket of the ether motor. But, of course, in practice, one can content himself with either of the installations. That is to say, have only one steam boiler when it is desired to operate with live steam (which is the most practical arrangement), or take the exhaust steam of an engine whose power may be increased without installing a new generator, and, consequently, increasing the output of coal.

The important point in the two cases is to first cause the steam to pass into the jacket of the cylinder of the engine, in order to prevent the condensation of the vapor of ether. In order to avoid complication in the engraving, the piping as a whole for each case is not represented in Fig. 3, but it is easy to get an idea of the manner in which the circulation takes place.

The trials which have been making for more than a month, every Tuesday, Thursday, and Saturday, at the works Mr. Digeon, and at which a large number of engineers and manufacturers have been present every time, establish in an undeniable way the immense saving resulting from this new method of utilizing the work of steam.

When one works with the live steam of the engine at a pressure of 2·5 kilogrammes, corresponding to a pressure of ether vapor of 10 kilogrammes, a power of 18 horses is developed upon the ether motor.

The quantity of water vaporized per horse and per hour is 6·66 kilogrammes, while in good steam engines it is at least 12, and the heating surface necessary to the generator is reduced to 0·27 square meter per horse. This diminution by one-half in the weight of the water vaporized evidently corresponds to an equal reduction in the weight of the fuel burned. It may, therefore, be asserted that under such conditions of pressure the saving in fuel is at least 50 per cent, and it may be added that it would be still more sensible if, instead of working at a pressure of 10 kilogrammes, one worked at 25, corresponding to that of 5 for steam, the tension of the ether vapor increasing more rapidly than that of steam.

When one works with the exhaust steam of the engine, the steam reaches the condenso-generator at a temperature of 95° and produces ether vapor at a pressure of 5·5 kilogrammes. The power collected upon the shaft of the ether motor is that of 10·52 horses. Now the engine running with free exhaust gives 5·9 horse power at the brake, and the passage of the steam into the condenso-generator gives rise to a slight counter pressure, which reduces the useful effect, measured upon the shaft, to 5·21 horse power.

If such diminution be taken into account, the supplementary power obtained is yet 9·83 horse, representing a saving of 63 per cent in the consumption of water and coal.

Supposing a condenser has been added to the steam engine, one would have simply increased its power by about 1·7, and it would have then given 5·74 horse power. The saving resulting from the use of the ether motor remains therefore nearly 60 per cent.

As may be seen, the results are most remarkable. They will, however, be notably surpassed when, instead of utilizing the exhaust of a steam engine, there will be made to circulate in the condenso-generator the gases derived from a gas motor.

In fact, as we have above said, such gases come from the cylinder at a temperature of about 300°, that is to say, more than double that of exhaust steam. There will, therefore, be obtained at the condenso-generator a pressure much higher than that given by steam, and consequently an increase in the work furnished by the ether motor. It would be easy to calculate the saving resulting from this combination, but for fear of appearing too favorably impressed, we prefer to await the results of the experiments that are to be made before long in this direction.

It is scarcely necessary to dwell upon the important bearing that Dr. De Susini's discovery will have upon the future of the steam engine. We shall simply say a few words regarding two of the most interesting applications—the production of electricity and the use of the ether motor on ocean steamers.

What has retarded the general application of electric lighting to cities is solely the much too high net cost of this system, which, despite all the improvements introduced into the apparatus for producing electricity, remains sensibly greater than that of lighting by gas or kerosene. But if, in order to produce electricity, we substitute an ether motor for the ordinary engine, the conditions differ all in all.

The saving of 50 per cent or more realized upon the cost of the horse hour is naturally found again upon the cost of the electric candle hour. The latter becoming less dear than its various competitors, and presenting, moreover, the advantages that every one knows, it is very evident that all municipalities will hereafter address themselves to it. What is true of lighting is equally so, and to the same degree, of electric propulsion, which is already so widespread, notwithstanding its high net cost, and which will be still more so when the electric horse hour shall cost less than the steam horse hour.

As for the marine, that will find in the use of the ether motor a solution of the three sole difficulties that limit the field of action and power of a ship, to wit: the supplying with coal and water and the impossibility, in the present state of steam engines, of increasing the speed of ships. The ether motor will permit either of reducing the quantity of coal to be carried by more than one-half, or, what amounts to the same thing, of more than doubling the voyage that a ship can make without being obliged to take on new supplies. It completely suppresses the need of a supply of fresh water or the substitution of it by distilled sea water, as that contained in the boilers serves indefinitely. Finally, it permits of running, if need be, at pressures of 25 and even 30 kilogrammes, corresponding to a temperature less than that of steam at 9 atmospheres, and consequently not presenting, as regards the heating of the parts, the inconveniences attending the use of steam at 12 or 15 atmospheres. We shall therefore be able to further increase, to a certain degree, the speed of ships, or, inversely, to reduce the dimensions of the motors.

What we have just said will suffice to demonstrate the interest that Dr. De Susini's motor presents.

Let us add that its introduction into practice is only a question of days. The inventor has already made arrangements with Mr. Lombard (the great manufacturer whose chocolate works are known to every one, and who will thus have the honor of attaching his name to the first application of Dr. De Susini's discovery) for the installation in his manufactory of a motor that is to utilize the exhaust steam of an engine that has become inadequate. Other negotiations are in progress in France as well as in England. Finally, Mr. Digeon's works are actively engaged in the construction of a double expansion motor of fifty horse power, which is to figure at the Chicago Exhibition, where it will certainly astonish our neighbors of the other side of the ocean (who are not very easy to excite, however), and show them that old Europe is not yet resigned to cede to them the precedence in the domain of great scientific and industrial discoveries, and that France, in spite of the crises that she has passed through and the reverses that she has endured, intends to keep her rank at the head of the army of progress.—*Les Inventions Nouvelles.*

Agavose.

In a recent number of the *American Chemical Journal* a report is given of researches on the sugar of the *Agave Americana*, by Gustave Michaud and Jose Fidel Tristan, of San Jose, Costa Rica. This is the plant from which the Mexicans make a species of whisky called pulque:

The results of the investigations may be stated in the following conclusions.

The *Agave Americana* contains a sugar of the formula $C_{12}H_{22}O_{11}$. This sugar differs from all other sugars of the same group, except synanthrose, by its inactivity. It differs from synanthrose by its power of crystallizing, by its action in Fehling's solution, and by the rotatory power of the products of its inversion.

We propose for this sugar the name of *agavose.*

Photos that Yield Colors.

At the last meeting of the Paris Academy of Sciences some colored photographs of the spectrum on albumen and bichromated gelatine, by M. G. Lippmann, were exhibited. It was stated that albumenized and gelatinized plates soaked in bichromate of potash may be employed for photographing in colors. They are used like silver salt plates, being placed so that the mercury is in contact with the film. The colors will appear immediately after immersion in water, which develops and also fixes the image. It disappears on drying, but reappears as soon as the plate is soaked. The colors are very brilliant, and visible at all angles. Those of gelatine plates are brought out by simple breathing. The theory is analogous to that of silver plates, the maxima and minima of interference producing hygroscopic and non-hygroscopic layers with varying refractive indices.

MATT ALUMINUM.—In order to impart the appearance of matt silver to metallic aluminum, the object is plunged, for from fifteen to twenty seconds, in a 10 per cent warm solution of caustic soda saturated with common salt. It is then washed and brushed, reimmersed in the same bath for half a minute, and finally washed and dried in sawdust.

Fruit Acids.

It is well known that the acids to which different fruits, etc., owe their flavor have been the subject of chemical investigations, which have revealed the following facts: The acid of the rhubarb stalk arises from the malic acid and binoxalate of potash which it contains. The acidity of the lemon, orange, and other species of the genus *Citrus* is caused by the abundance of citric acid which their juices contain; that of the cherry, plum, peach, apple, and pear from the malic acid in their pulp; that of gooseberries and currants, black, white, and red, from a mixture of malic and citric acids; that of grapes from a mixture of malic and tartaric acids; that of the mango from citric acid and a very fugitive essential oil; that of the tamarind from a mixture of citric, malic, and tartaric acids; the flavor of asparagus from aspartic acid, found also in the root of the marshmallow; and that of the cucumber from a peculiar poisonous ingredient, called fungin, which is found in many species of fungi, and is the cause of the cucumber being objectionable to some persons.

It will be observed that rhubarb is the only product which contains binoxalate of potash in conjunction with an acid. It is this ingredient which renders rhubarb so wholesome at the early commencement of the summer, though in certain cases, known to medical men, its use may be injurious.

The following table, compiled from some analyses by Professor Berard, shows the percentage average chemical composition of five unripe fruits and of eight ripe fruits, comprising apples, pears, gooseberries, grapes, plums, cherries, apricots, and peaches:

	Unripe.	Ripe.
Water	85·7	78·7
Albuminoids	0·7	0·6
Sugar	4·0	12·9
Vegetable acids	1·5	1·3
Pectose and gum	4·3	3·7
Cellulose, etc	3·8	2·8

The data thus given show that there is a considerable decrease in the watery particles of fruit as it approaches its full ripe character, resulting in a difference of 7 per cent, while the sugary constituents increase during maturation in a corresponding degree, rising from an average of 4 to nearly 13 per cent.

There is very little actual decrease in the percentage of acids from the green to the ripe stage of fruits, but the acidity becomes neutralized by the increase of sugar as the fruit approaches maturation.

Many persons know from experience how much more pleasant and agreeable fruit is when gathered and eaten direct from the tree. This is undoubtedly in part due to the freshness and briskness of the vegetable acids contained in the fruit, which, when so gathered and eaten, have not time to change into any other substance. Stale fruit, on the other hand, is unpalatable from the very fact that it has lost this pungent and brisk taste.

Pectose forms the substance known as vegetable jelly, and it is to this constituent of fruits that jams owe their firmness. Cellulose is the fibrous part of fruits, and this portion contains the largest proportion of mineral salts.—*Chem. Tr. Jour.*

The Best Education for Young Men.

"I believe that in the schools of applied science and technology, as they are carried on to-day in the United States—involving the thorough and most scholarly study of principles directed immediately upon useful arts, and rising, in their higher grades, into original investigation and research—is to be found almost the perfection of education for young men. Too long have we submitted to be considered as furnishing something which is, indeed, more immediately and practically useful than a so-called liberal education, but which is, after all, less noble and fine. Too long have our schools of applied science and technology been popularly regarded as affording an inferior substitute for classical colleges to those who could not afford to go to college, then take a course in a medical or law school, and then wait for professional practice. Too long have the graduates of such schools been spoken of as though they had acquired the arts of livelihood at some sacrifice of mental development, intellectual culture, and grace of life. For me, if I did not believe that the graduates of the institution over which I have the honor to preside were better educated men, in all which the term educated man implies, than the average graduate of the ordinary college, I would not consent to hold my position for another day. It is true that something of form and style may be sacrificed in the earnest, direct, and laborious endeavors of the student of science; but that all the essentials of intellect and character are less fully or less happily achieved through such a course of study let no man, connected with such an institution, for a moment concede!

"That mind and manhood alike are served in a preeminent degree by the systematic study of chemistry, physics, and natural history has passed beyond dispute. The haste with which the colleges themselves are throwing over many of their traditional subjects to make room for these comparatively new studies, shows how general has become the appreciation of the virtue of these, when combined with laboratory methods, as means of intellectual and moral training.

"I have spoken of the characteristic studies of the new schools as the best of all available means of both moral and intellectual training. I believe this claim to be none too broad.

"The sincerity of purpose and the intellectual honesty which are bred in the laboratory of chemistry and physics stand in strong contrast with the dangerous tendencies to plausibility, sophistry, casuistry, and self-delusion which so insidiously beset the pursuit of metaphysics, dialectics, and rhetoric, according to the traditions of the schools. Much of the training given in college in my boyhood was, it is not too much to say, directed straight upon the arts which go to make the worse appear the better reason. It was always an added feather in the cap of the young disputant that he had won a debate in a cause in which he did not believe. Surely, in these more enlightened days, it is not needful to say that this is perilous practice, if, indeed, it is not always and necessarily pernicious. Even where the element of purposed and boasted self-stultification was absent, there was a dangerous and a mischievous exaltation of the form above the substance of the student's work, which made it better to be brilliant than to be sound.

"Contrast with this the moral and intellectual influence of the studies and exercises I am considering. The student of chemistry or physics would scarcely know how to defend a thesis which he did not himself believe. In that dangerous art he has had no practice. The only success he has hoped for has been to be right. The only failure he has had to fear was to be wrong. To be brilliant in error only heightened the failure, making it the more conspicuous and ludicrous."—*Francis A. Walker, President of the Massachusetts Institute of Technology.*

The Uses of Magnesium Oxide.

Magnesia, formerly chiefly valued on account of its medicinal properties, has recently risen into great commercial importance, owing to its infusibility and its employment as a lining for converters used in the basic process of steel manufacture. Caron, whose process was in the first instance followed, used calcined magnesite. This was made up with one-sixth of its weight of tender-burned magnesia and from ten to fifteen per cent of water, into a plastic state. It was then compressed into bricks in iron moulds and burned at a dull heat. Prof. Ehrenworth has pointed out that, if the refractory properties of the magnesia are to be developed to the full, it is of the utmost importance that the whole of the magnesia should be dead-burned; the process, moreover, being carried so far as not only to expel the whole of the carbonic acid, but also to cause the full amount of shrinkage which this material is capable of attaining. This extreme amount of calcination is very difficult to effect, owing to the tendency of the magnesite to fly into splinters, and to drop to pieces when subsequently touched, and, in consequence of its being such a bad conductor of heat, the stone is very hard to burn in large pieces.

Recently dolomite, which is a double carbonate of lime and magnesia, has been used instead of magnesite. In order to prepare this material there are two processes before the public: those of Closson and of Scheibler. Under the former plan the calcined dolomite is mixed with chloride of magnesium, the chlorine in which separates from the magnesia and combines with the lime, yielding a soluble calcic chloride, which can readily be washed out, leaving behind the insoluble magnesia. Under the process of Scheibler the calcined dolomite is treated with dissolved sugar, leading to the formation of sugar of lime, and depositing the magnesia. The solution of sugar of lime is then exposed to carbonic acid gas, which separates the lime as a carbonate, leaving the sugar ready for re-use. Both these systems of producing magnesia have the advantage of relative cheapness in their favor, owing to the low price of dolomite. Prof. Frank, of Charlottenburg, has advocated the use of magnesia as a substitute for plaster of Paris for casts, and Grundmann has recently shown the advantage of employing a mixture of magnesia and powdered marble for this purpose. It has also been found that by following the direction given by Hirzel a mixture of benzole and magnesia is the very best possible substance for the removal of grease from drawings or from any other material.

Detaching Gelatine Negatives from Glass.

Herr Liesegang's method of detaching gelatine films from the glass supports without employing the hydrofluoric acid plan is to introduce between the gelatine and the glass carbonic acid gas, which will effect the separation. The negative or positive, after development, etc., is plunged into a bath made feebly acid with either citric, hydrochloric, or sulphuric acid, and then, without washing, is placed in a concentrated solution (25 to 30 per cent) of carbonate or bicarbonate of soda. The carbonic acid gas thus formed puffs up the gelatine, which can then be easily removed. The film undergoes some enlargement, which could probably be obviated by a bath of absolute alcohol, and when dry the film is perfectly flat, and can then be attached to a collodion or gelatine support, as may be desired.

Baldheads, Young and Old.

Our illustrious American electrician Edison is now studying the subject of baldheadedness. He maintains that bald pated people die young, while people who are well roofed with hair live long, and he believes that, as he himself has a fertile scalp, he will live to a ripe old age.

We cannot believe that Mr. Edison has ransacked the pages of history for proof of his hirsute theory. We are confident that, if he can be induced to examine the portraits of the great, he will change his mind on the subject. We are able to tell him that very many of the eminent personages of the world who were short of hair, even in their early manhood, lived to a green old age, and we can show him the pictures of inventors, commanders, sages, statesmen, saints, and nabobs who began to grow bald when young, and grew steadily balder as they grew older right straight along. Where shall we begin with our illustrations? Socrates the Greek and Cæsar the Roman were both disposed to baldness in their prime, yet the former lived for over seventy years and the latter for nearly sixty. From Cæsar's time to that of Peter the Hermit, from Columbus' time to that of Voltaire, from the "Sage of Kinderhook's" time to that of Gen. Ben Butler, we can name numerous persons of eminence whose locks began to fall long before they reached middle age, yet who lived to be as old as Mr. Edison himself will be when he is an octogenarian. Not a few of our revolutionary sires were bald, having begun to shed their hair while yet colonists, and we must ask Mr. Edison not to be deceived by the pictures of that period, but to bear in mind that, up to the opening of this century, the large bottomed wig was used by many of the gentlemen of our country. What does Mr. Edison know about the baldness of the three Adamses or about the locks of Jefferson, Hamilton, and several of their compeers? Can he tell us whether the Father of his Country wore artificial hair? Did he ever see a man adorned with a toupee, to say nothing of a peruke? We forewarn Mr. Edison that, in ransacking history for facts bearing upon baldheadedness, it is necessary to proceed with caution. He will find, by the allusions of ancient and modern authors to the habit of wig wearing, that very many notable men have had very much less hair atop than they were credited with.

Even in our own times, alas! there are not a few distinguished Americans from thirty to eighty years old who are as baldheaded as the Hebrew prophet Elisha was. Let Mr. Edison go to the city of Washington and look down upon the heads of the members of the United States Senate. He will see senators there who are as lively as crickets, though they have been more or less bald for the greater part of a half century. Let him then go abroad and find out for how many years Gladstone's hair has been growing ever sparser, or Bismarck's, or a hundred other great men's. Let Mr. Edison prosecute his researches around the world, and send us the baldheaded news from China, Japan, and other countries.

The truth is that Mr. Edison cannot possibly sustain his contention that long-lived men always have "thick heads of hair." He says that his own father, who is yet vigorous at eighty-three—and long may he flourish!—has a "wonderful head of hair;" but we can offset this case by that of a citizen of New York over ninety who has been bald since he was in his twenties. We are prepared to affirm and to prove that the abundance of a man's hair does not surely betoken long life, and that the baldness of a man's head does not betoken his early death. We can give piles of facts upon this subject. We have just elected a President who is rapidly growing bald, though yet far from old age. Several of the ancient sages regarded early baldness as a sign of early wisdom. We admit that it has not been so in Edison's case, for he has lots of hair on his head; but Edison must not judge all mankind by himself.

The baldness of some people is due to heredity. In this city there is a family of three generations, all the members of which are beyond maturity, all of whom began to grow bald when about twenty years old; and the grandsires' father was as bald when young as he is when old. In other cases the loss of the hair is caused by solar heat, or by febrile maladies, or by the action of parasites, or by erythematous affections of the scalp, or by the wearing of tightly fitting and unyielding hats, or perhaps by deep thought. The learned French barber of this city, who has made scientific study of the hair of the heads of his customers, says he could make an immense fortune if he knew how to cause the hair to grow upon those bald scalps in which the epidermic cells are closed. He has striven for a lifetime to invent something that would be potent in this line, or that would give the promise of potency; but he confesses with sorrow that his labor has been in vain.—*N. Y. Sun.*