"How to Make the Most of Life."

The Grindelwald Conference held this year was marked by a new feature. In addition to the religious discussion which had previously taken place, there was opened on August 13 a literary and scientific department, the debates in which were to continue at intervals for a month. The introductory address in this section was given by a member of our own profession, Sir Benjamin Ward Richardson, with after addresses delivered by Sir Robert Ball, Mr. Whymper, Mr. Carus Wilson, Mr. Edmund Gosse, and several others.

The title of the introductory address was, "How to Make the Most of Life," the lecturer dealing naturally with the physical side of the question in the first place. He set forth by stating that, according to his views, that man or woman who trained himself or herself in the best bodily and mental health made the best of life. He considered the bodily welfare first, not because he reckoned it more important in itself, but because the health of the mind so largely depends on the health of the body. He then described the various conditions leading to good bodily health, and showed how a good engine outlived many of its masters because they attended to it more carefully than they attended to their own bodies; kept it clean, made it regular in its work, freed it from obstruction in its furnaces, and fed it with proper and simple fuel and pure air.

He then traced the relationship of life to maturity, indicating that life should extend five times the period of maturity, so that a man taking twenty-one years to mature should live to 105 years. Such length of life was exceptionally obtained, which showed the possibility of the occurrence; and why it was not more widely obtained in the human species was due to errors, often of the grossest kind, some of which were pointed out. In passing to the question of mental health, the lecturer dwelt on three subjects—diligence, learning, and travel. Diligence he thought a better term than work, because it included everything; diligence in labor, in play, even in sleep. "Blest are the diligent who can command time, Nature's clock." Of learning he said that the most important was historical, and among the historical the most important was biographical. "Know the life of a man of any period," he remarked, "and you must then know not only the man, but his period also." The fact was illustrated from several instances, but especially from such as showed the existence of great men who in their own time were practically unknown; men, for instance, like Stephen Grey, who, in the early part of last century, carried from the Charterhouse to Faversham the elementary parts of our present electrical science in the little basket, from the contents of which he laid down the first elementary electric telegraph.

Dealing with travel, Sir Benjamin Richardson treated on the marvelous expansion of the mind that came from excursions over the world. The famous Dr. William Harvey and men of his school made the "grand tour" in their day. They went to Italy, came back, as it was said, "Italianated," and were thought to be remarkable scholars. Now men went all over the globe; the whole world became their Italy, and they might be said to be "planetated." This was a mode of learning in which the surface of the earth became the living map, the spoken languages, the living grammars—a mode that must extend day by day as the mind yearned for more knowledge and the power that springs from it. He saw no end to a line of learning by travel now inaugurated, and he suggested as the next step that university ships should be manned, not with guns and fighting men, but with professors, laboratories, observatories, and libraries, and in which voyages of research should be made by all classes round the world, England, as mistress of the seas, leading the advance.—The Lancet.

SPEAKING WATCHES.

To get up anything new in the way of watches seems difficult. The precision of the present construction leaves little margin to progress, and the indications that it has been possible to give these small instruments are so numerous and interfere so little with the perfect running of them that we might consider perfection as having been nearly reached in watchmaking.

Mr. Sivan, a French watchmaker, established at Geneva, has, nevertheless, succeeded in stepping outside of the beaten track in devising a chronometer that speaks the hours, instead of striking them, through an ingenious application of the phonograph.

The ordinary repeating watch carries a detent through which it is possible to free a small movement that actuates little hammers which strike spring bells. It is thus possible to strike the hours, quarters and even the minutes at will. This bell device, which is essentially monotonous, requires, moreover, close attention on the part of the owner of the watch, who is obliged to count the strokes and to distinguish the intervals between the hours, quarters and minutes. There are no such inconveniences in the Sivan watch. The spring bells are replaced by a vulcanized rubber disk provided with grooves upon which the hammers bear, through a point. The accompanying figures will permit of the operation being understood.

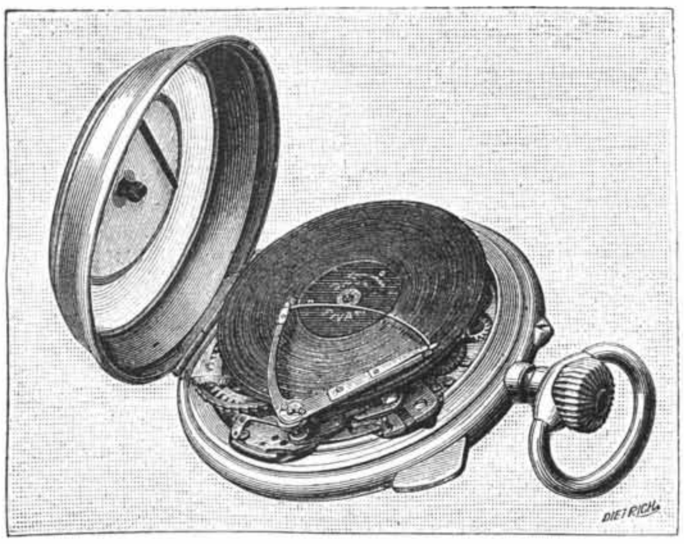

Fig. 1.—SPEAKING WATCH, WITH ITS PHONOGRAPHIC DISK.

Fig. 1 represents the watch open, with its phonographic disk, which is provided with 48 grooves that correspond to the 12 hours and to the 36 quarters traversed by the hand in making one revolution of the dial. Fig. 2 shows the same watch, from which the disk has been removed in order to allow the mechanism to be seen. This disk is seen on the side opposite that carrying the grooves.

When the detent is pressed, the rubber disk begins to revolve, the point that follows its sinuosities vibrates, and the vibrations are manifested by such expressions as "It is eight o'clock," "It is half-past twelve," etc. The grooves, in fact, are the exact reproduction, upon a plane, of the helicoidal groove produced by a human voice upon a phonograph cylinder.

Naturally, watches are not the sole pieces of wheelwork to which this ingenious system is applicable. All clocks may be provided with it, and, for the moment, Mr. Sivan is already constructing alarm clocks which, instead of the strident and ear-piercing bell that every one is acquainted with, have speaking disks. One can thus have himself awakened by the crowing of the cock, or by the vigorous accents of a well known voice. The inventor is constructing some alarms which, with a disk of 6 or 7 centimeters, cry out to you from one room to another, through closed doors, such phrases as "Get up !" "Come, wake up !" loudly enough and long enough to snatch you from the arms of Morpheus.

In addition to the difficulty resulting from the disproportion between the smallness of the grooves and the force that is necessary to give the sound, Mr. Sivan has had several others to surmount. It was necessary, in the first place, to introduce the system into a watch case without exaggerating the latter's dimensions, and afterward to find a plastic, although resistant, material for the disks. These obstacles have been happily surmounted. Mr. Sivan's watches resemble the ordinary repeaters; and their disks, despite the pressure of the point, are capable of speaking several thousand times without showing any appreciable wear.

Further, by retouching the phonographic grooves, suppressing some of them, and exaggerating others, the inventor has succeeded in giving the words pronounced the peculiar accent characteristic of such or such a locality. Amateurs who may not be content with ordinary disks will thus be able to order others that will be true family souvenirs. There is no limit to the variety of the combinations of which the realization becomes possible with this system.

There is one thing, however, that it will be necessary to see to, and that is, that in houses that possess several speaking watches or clocks, the latter shall run in perfect unison. Otherwise their disputes, sources of pernicious examples, might chance to disturb the tranquillity of serious households and cause steady people to lose their reckoning. But the precision of the apparatus easily permits of avoiding such an inconvenience.—La Nature.

CHICAGOANS per capita are not as well policed as Londoners, the police in Chicago numbering only 2,726 for 1,600,000 people against London's 13,814 for 5,000,000 population.

Gas Motor Cars.

The gas motor cars on the Croydon tramways are (says a correspondent of the Glasgow Herald) working satisfactorily, the cost being about 25 cubic feet of gas per car mile. They carry 28 passengers, and go on routes with gradients of 1 in 23, with short lengths of 1 in 16. This cost is against 3½d. per mile for fodder and bedding of horses, so that in future this type of motor must be ranked in competition with electric and cable haulage. Indeed, from official returns of the German tramways just out, the results of the gas motor cars are shown to be very formidable. The cost of a car weighing 7½ tons empty, to carry 29 persons, and fitted with two 7 horse power gas engines, is £900, and the gas consumption, with 10 to 12 persons on board, is from 34·7 to 37 cubic feet per car mile. The engines are under the seats, and are arranged to work at three rates of speed, the maximum being 240 revolutions. As to cost of construction, five miles with cars running every five minutes, requiring 20 cars, and working 14 hours per day, is put at £1.040 per mile, including everything; while in Germany the cost for an electric tramway is £7,648 per mile, and for a horse tramway £5.636. The working expenses with gas at 3s. 5d. per 1,000 cubic feet are about 3d. per car mile, with 1 horse cars of 4½ tons weight, carrying 22 persons; and with a 10 horse power gas motor the cost is 4·25d. to 5·4d. per car mile. For electric tramways the cost in Germany has been found to be 3·86d. per car mile. The conclusion arrived at is that, with similar traffic conditions, a gas tram might be expected to give a return of 6½ per cent on the capital invested, while an electric tram would barely cover cost of working.

Acids of Beeswax.

T. Marie describes a method for the extraction of the free acids in beeswax, which gives good results if it is applied to mixtures of acids, so long as bodies belonging to other organic series are absent. Beeswax, when treated by boiling alcohol, yields to this solvent not only the free acids present, but also hydrocarbons, oleic compounds, coloring matters, and myricin, which are difficult to separate properly. The method adopted for obtaining the acids free from these other substances is as follows: After the wax has been treated by the boiling alcohol, the greater part of the latter is subsequently distilled. The cooled and crystalline residue is then squeezed to separate oleic compounds and coloring matters, after which the solid cake is melted, washed repeatedly with boiling water, and further decolorized by charcoal and filtration through paper.

The slightly yellow mass thus obtained melts at 70°. This, after being heated with potash and lime, is cooled, powdered, and mixed with a large quantity of water, which is then heated to ebullition. Dilute hydrochloric acid is then added to neutralize the

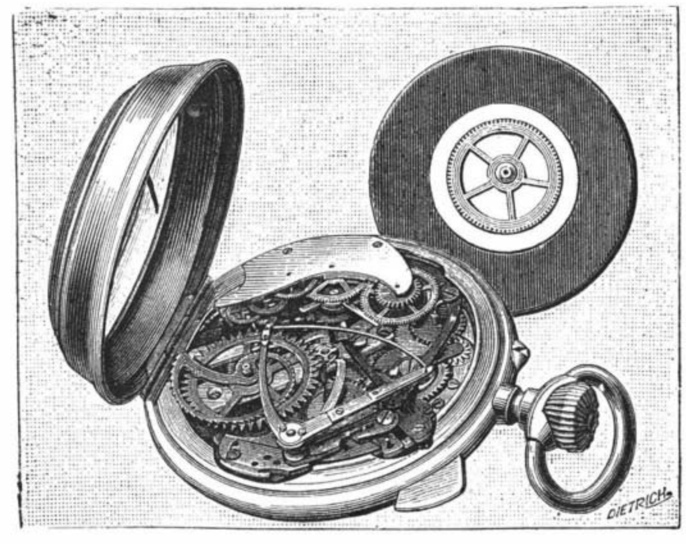

Fig. 2.—SPEAKING WATCH, WITH THE DISK REMOVED, IN ORDER TO SHOW THE INTERNAL MECHANISM.

alkali, and the free acids of the wax combine with the soluble calcium salts in the mixture to form insoluble compounds. The latter are separated, washed, and dried, then treated with boiling alcohol and benzin to remove neutral substances, and decomposed. The acids thus isolated, after crystallization from alcohol, which removes a small quantity of palmitic acid formed from the myricin, melt at 79°–80°. By further treatment with methylic alcohol cerotic acid is dissolved out, and on crystallizing is found to melt at 76°, the melting point being raised to 77·5° after a single crystallization from ethylic alcohol. The residue melts at 78°, and contains melissic acid, described as identical with that extracted from carnauba wax by Story-Maskelyne and Pieverling. Crude cerotic acid is said to contain from 30 to 40 per cent of analogous acids, and Marie announces his intention of further studying the pure compound and its derivatives.—Comp. Rend., cxix., 428.

Thin Films of Gold.

One of the interesting exhibits made at the recent conversazione of the Royal Society, held June 13, 1894, was that of Mr. J. W. Swan, F.R.S., who presented a number of specimens of leaves of gold of extreme thinness, which had been prepared by the process of electro-deposition. From a brief notice of the exhibit, published in London Nature, it appears that it represented an attempt by Mr. Swan to produce gold leaf by electro-chemical, instead of mechanical means. "The leaves were prepared by depositing a thin film of gold on a highly polished and extremely thin electro-copper deposit. The copper was then dissolved by perchloride of iron, leaving the gold in a very attenuated condition. The leaves were approximately four-millionths of an inch thick, and some of them mounted on glass showed the transparency of gold very perfectly when a lighted lamp was looked at through them."

It will doubtless prove somewhat of a surprise to Mr. Swan to learn that identically the same method of procedure for the production of films of metal of extreme tenuity was described and illustrated by Mr. A. E. Outerbridge, Jr., in a lecture delivered before the Franklin Institute in 1877, an abstract of which was published in the Journal.* At the stated meeting of the Institute held May 16, 1877, the then resident secretary, the late Mr. J. B. Knight, made reference in his monthly report to the thin gold films produced by Mr. Outerbridge in the following terms: †

Transparent Gold.—In the course of a lecture on gold, delivered before the Franklin Institute, on February 27 last, Mr. A. E. Outerbridge, Jr., of the Assay Department of the Mint in this city, gave an account of some experiments he had made, with the view of ascertaining how thin a film of gold was necessary to produce a fine gold color.

The plan adopted was as follows: From a sheet of copper rolled down to a thickness of 5-1000 of an inch, he cut a strip 2½×4 inches. This strip, containing 20 square inches of surface, after being carefully cleaned and burnished, was weighed on a delicate assay balance. Sufficient gold to produce a fine gold color was then deposited on it by means of the battery; the strip was then dried without rubbing, and reweighed, and found to have gained one-tenth of a grain, thus showing that one grain of gold can, by this method, be made to cover 200 square inches, as compared to 75 square inches by beating.

By calculation, based on the weight of a cubic inch of pure gold, the thickness of the deposited film was ascertained to be 1-980400 of an inch, as against 1-367650 for the beaten film.

An examination under the microscope showed the film to be continuous and not deposited in spots, the whole surface presenting the appearance of pure gold.

Not being satisfied, however, with this proof, and desiring to examine the film by transmitted light, Mr. Outerbridge has since tried several methods for separating the film from the copper, and the following one has proved entirely successful.

The gold plating was removed from one side of the copper strip, and by immersing small pieces in weak nitric acid for several days, the copper was entirely dissolved, leaving the films of gold intact, floating on the surface of the liquid. These were collected on strips of glass, to which they adhered on drying, and the image of one of them is here projected on the screen, by means of the gas microscope.

You will observe that it is entirely continuous, of the characteristic bright green color, and very transparent, as is shown by placing this slide of diatoms behind the film. By changing the position of the instrument, and throwing the image of the film on the screen by means of reflected light, as is here done, you will see its true gold color.

Mr. Outerbridge has continued his experiments, and, by the same processes, has succeeded in producing continuous films, which he determined to be only the 1-2798000 of an inch in thickness, or 10,584 times thinner than an ordinary sheet of printing paper, or 60 times less than a single undulation of green light. The weight of gold covering 20 square inches is, in this case, 35-1000 of a grain; one grain being sufficient to cover nearly 4 square feet of copper.

As you see, the film is perfectly transparent and continuous, even in thickness, and presents all the characteristics of the one shown before. That a portion of the image appears darker is due to superposed films, the intensity of the green color being proportioned to the thickness through which the light passes. . . .

It may be stated, in conclusion, that the mode of procedure above described was patented by its author‡ under the title "Manufacture of Metallic Leaf." In his patent the inventor describes, as "a new and improved method of manufacturing gold leaf, silver leaf and other metallic leaf," the above named method of electrical deposition. As suitable mediums to support his films he mentions copper in thin sheets, and paper, shellac, wax, etc., made conductive upon the surface which is to receive the deposit.

For removing the deposited film from copper and paper, Mr. Outerbridge describes the use of a bath of dilute nitric acid, or of perchloride of iron. In the case of the shellac, wax, etc., alcohol, benzine, and other solvents are referred to.

While they detract neither from the interest nor genuineness of Mr. Swan's work, these circumstances are recalled in justice to Mr. Outerbridge, to whom priority undoubtedly is due.—W., [Jour. Fr. Inst.

* Vide Jour. Frank. Inst., clii, 284.

† Vide Jour. Frank. Inst., clii, 369.

‡ U.S. Patent, 198,209, Dec. 18, 1877.

A First-Class School for Watchmakers and Jewelers.

The Parsons Horological Institute at Peoria, Ill., of which Mrs. Lydia Bradley has been the beneficent patron, appears to be realizing the solid success which its design and scope made so eminently desirable. It will be remembered that a full description of the institute, with illustrations, was published in the Scientific American of July 8, 1893. It was the outgrowth of a school for watchmakers originally founded by Mr. J. R. Parsons at La Porte, Ind. The school had got beyond its original limited facilities, when Mrs. Lydia Bradley, of Peoria, Ill., furnished the means for providing a fine building, with all the tools and appliances necessary, for the use of any number of deserving young men and women who wished to learn the trade of watchmaker and jeweler.

The building, and such machinery and appliances as could be turned to the uses of an educational establishment, was for many years used by the Peoria Watch Company, so that a portion of the instruction given is effected by the aid of the tools and appliances formerly employed in making watches for the trade. The location and the conveniences for enabling students to obtain a practical knowledge of the business are all that could be desired, and Mr. Parsons, who had previously devoted many years to the purpose of building up such a school, now finds himself at the head of an ideal establishment of this kind, one of the leading technological establishments of the world in this particular department.

The object of the institute is not to make money, but to turn out competent watchmakers and jewelers, and the tuition is, therefore, made very low. Metal engraving is an important feature of the school, together with the various methods of making and repairing the many kinds of silverware. A lecture on demagnetizing and electricity was recently delivered at the institute by Mr. Fred. Purdy, and a course of lectures by eminent scientists will be delivered the coming winter.

Diamond Mining in South Africa.

Kimberley, in Griqualand, is the center of the diamond traffic of South Africa. Mr. A. G. Phillips, of Johannisberg, South Africa, recently called upon us and showed us some gravel and clay taken directly from the mines of Zelsers, at Delpots Hope, not far from Kimberley. The clay contains specimens of quartz, chalcedony, onyx, and other varieties of stones and conglomerates, and the small diamond crystals are found embedded in the deposits, which are apparently alluvial deposits carried down in past ages by the feeders of the Orange River. In the separating of the clays from the pebbles the latter wash out very smooth and round and show evidences of having been carried long distances before being deposited in their present localities. The diamonds themselves further verify this hypothesis, as in some cases they are found as perfect crystals, but more often as fragments. They are not alone found, however, in alluvial deposits, as in many cases the matrix in which they are embedded is volcanic matter that has been forced up in channels or pipes from inferior deposits.

The method of separation is very simple and primitive, and it would seem that great economy could be effected by the introduction of mechanical washers, but the negro labor is so cheap that up to the present time there has been little advance over the original methods first introduced. It would seem that the dishonesty of the negroes would, however, force the mine owners to introduce any methods that would lessen their opportunities for stealing. The clay as it is taken from the mines is simply washed in a series of gauze trays, which permit the water and mud to flow away, but retain all substances of any considerable size. These screens are made of different capacity or grades, and the pebbles are therefore separated according to their sizes and collected in trays, where they are carefully examined. The negroes are very acute and are wonderfully alert in discovering the presence of the much-sought-for gems. One negro under the present system only washes on an average about sixteen cubic feet of earth a day. All the cunning of their nature is called out in their endeavors to elude their masters and to smuggle gems out of the mines without being detected. Every workman as he leaves the mines is subjected to the most rigid examination. All his clothes are removed and the inspectors make a most thorough examination of his person. Their ears, mouth, nose, toes, and toe and finger nails are all carefully investigated, and severe punishment is meted out to any one found attempting to steal.

They are never permitted to pass out of the sight of the mine police, and in case they have procured permission to leave the precinct of the mines and to visit the neighboring towns, they are kept in confinement, and their whole system is subjected to a thorough cleansing with purgatives for a period of ten days before they are released. In spite of every precaution that can be taken, the stealing cannot be stopped, and it is claimed that nearly 25 per cent of the South African diamonds sold in the market are illicit or stolen property. This is so in spite of a police system more perfect than is to be found anywhere outside of Russia. A complete record is kept of every stone mined, and the red tape that has to be gone through in the purchase of a diamond is very striking. An intending purchaser in any of the well known markets has to make application of the authorities to purchase certain stones. Written permission is then granted him and the transfer is made, then the purchaser has to procure a license to carry about with him and take out of the country the diamonds in question. The license states the number and weight of the stones, their color and general appearance, where they were mined, whom they were bought from, the purchase price, and every detail of the transaction that would tend to identify them. It is expedient for any one carrying a gem on his person to have his license with him, as he is liable to be stopped at any time by a detective or policeman, and if he is suspected of being an illicit dealer, his person is searched and he is required to establish the identity of any stones found on his person. His license, of course, will accomplish this, but in case he cannot produce it, or cannot refer to the public registration, which is always made when the license is issued, he is thrown into prison and tried as an I. D. B., as the illegal diamond buyers are called. There are a large number of I. D. B.'s, both whites and blacks, now working out long sentences at the government penitentiary. The sentences are very severe, as the colonial government is doing all in its power to wipe out the illegal traffic. Many of the diamond thieves escape into the neighboring provinces, where they cannot be reached by the laws in the colonies. The Orange Free State, which is very near the diamond district of Griqualand, is a favorite refuge for smugglers, and fugitives from justice find this the same haven of rest that Canada is to fugitives from this country.

It is no wonder that the blacks try to steal, although, as a rule, their compensation is very meager. It is said that the king of one of the leading tribes has a half bushel basket full of diamonds that he has exacted from the natives of his tribe upon their return to their native land.

He rents out the services of his subjects, and one condition of his permission to leave the country is that upon their return they must present their chief with a diamond or its equivalent in gold.

The I. D. B.'s, however, are not all so desirous of fleeing the colony, and many of them carry on their trade in a manner so cunning and so secret that they feel secure from justice, and in some cases, although their nefarious traffic may be an open secret, they have amassed fortunes which they are permitted to enjoy, owing to the fact that there is no legal proof that can be brought against them. One notable instance of this is the case of a Jew, who came to Griqualand some twelve or fifteen years ago, and who, in some mysterious way, has amassed a fortune of nearly a million pounds, upon which he is now living in great magnificence. He is known to be an I. D. B., but he has covered up his transactions with such cleverness that the accusations against him are only whispered. He has been elected a member of Parliament, and no doubt now intends to become a respectable member of society.

A Balloon Struck by Lightning.

An occurrence partaking of the nature of the Franklin experiment is reported from Aldershot. A captive balloon was held by a wire cable about 200 feet long. Suddenly it was struck by lightning, which ignited the gas, the balloon falling to earth amid a loud peal of thunder. Three of the sappers at the winch below were seen rolling on the ground, apparently in intense pain. This is attributed to their connection to the wire cable through the brass handles of the winch. One, a bugler, had the inside of his hand rather badly burnt, but the worst case of all showed no external signs of injury. The car of the balloon fell without doing any damage. On examination it was found that all the upper part had been burnt away, though the metal valve was almost uninjured. Had any one been in the car, even if he had escaped uninjured from the electric shock, he would have had a terrible fall. None of the sufferers were very seriously injured.

The United States has over four hundred institutions known as college or university.