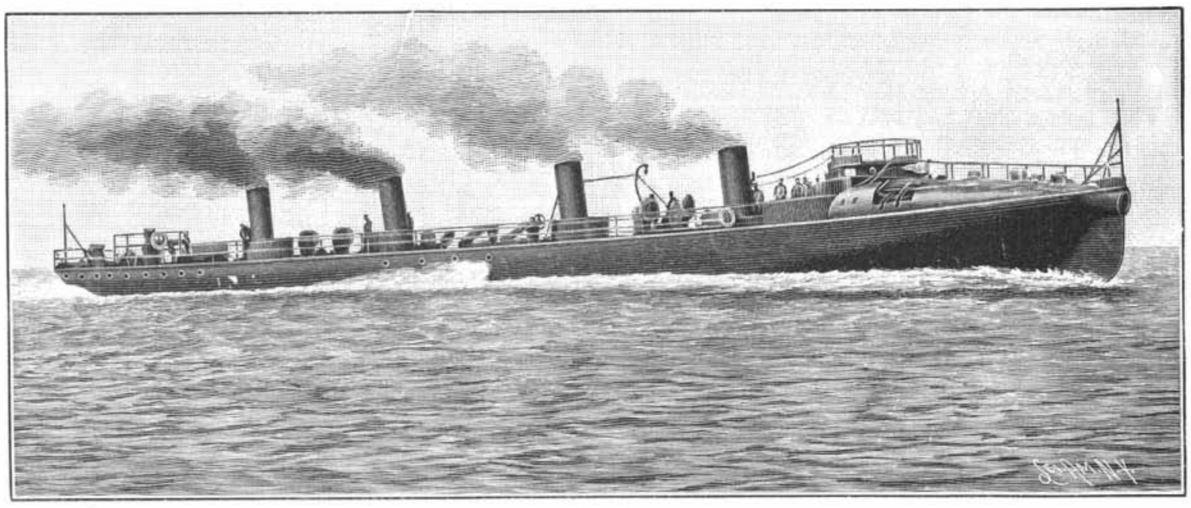
THE TORPEDO BOAT DESTROYER FERRET.

The third of the large fleet of torpedo boat destroyers built for the British government has just completed her official trials, and the builders, Messrs. Laird, of Birkenhead, have to be congratulated on a highly successful issue.

The Ferret is 194 feet long between perpendiculars, with 19 feet 3 inches beam, the ratio being, therefore, about 1 to 10, and at a draught of 5 feet the displacement is 220 tons. The hull is divided into twelve main compartments by water-tight bulkheads, and a water-tight lower deck is built forward of the machinery space, below which there are eight separate water-tight magazines and storerooms, and a water-tight flat is fitted aft of the machinery space. Abaft the machinery 40 feet is devoted to the wardroom and cabins where the officers are berthed, and the crew is accommodated forward. The bunker capacity is 70 tons. The armament consists of one 12 pounder and three 6 pounder quick-firing guns, one pair of torpedo tubes on the deck, and one tube in the bow. She carries the new 18 inch torpedoes.



THE TORPEDO BOAT DESTROYER FERRET.

The engines are of Messrs. Laird's fast running tri-compound type, the cylinders being 19 inches, 29 inches and 43 inches in diameter by 18 inch stroke, and it is worthy of notice that all parts of the engines are accessible when working at full speed, as Messrs. Laird have been able to arrange a good passage at the back of the machinery, which will no doubt be found of great advantage compared to the ordinary torpedo boat type of engine room. The two circular condensers are placed forward of the main engines instead of in the wings, which involves an increase in length of engine room, but gives a wider platform between the engines and a good passage all round, as indicated.

The average speed of six runs on the measured mile was 27·612 knots per hour. Mean indicated horse power. 4,507.

When considering the design of the boat, it became necessary to adopt the water tube type of boiler on account of the saving of weight which it admits of as compared with the locomotive or any other type, and, after careful consideration, Messrs. Laird decided to adopt the Normand type, which has been proved in the numerous torpedo boats built by Messrs. Normand at Havre to give excellent results. The Ferret's performance has fully justified the selection, no difficulty being experienced throughout the three hours' trial in maintaining the steam at the intended pressure. There was no indication of priming, either on the official or any of the preliminary trials, and, therefore, one of the principal difficulties of the water tube type has been overcome.

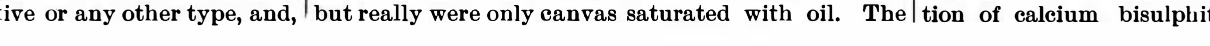
The official trial took place on the measured mile at Skelmorlie, on the Clyde, on the 10th of July, in the presence of Mr. Deadman and Mr. Pledge, representing the Constructor's Department of the Admiralty, and Mr. Ellis, the engineer-in-chief, and Mr. Hobbs, of Devonport Dockyard. The builders were represented by Mr. J. M. Laird and Mr. R. R. Bevis, Jr.

The three hours' trial was commenced at 10:15 A. M., the vessel having on board her full normal weight, the coal in bunkers being 26 tons, and the average speed for the whole time was found to be 27·51 knots with 361 revolutions. After the run the usual trials as to maneuvering were made—the helm was put from hard over to hard over both ways in less than 12 seconds each at full speed, and the steering was proved to be entirely satisfactory. There was a remarkable absence of vibration when running at full speed, and no hitch of any kind occurred in the machinery. The speed for the six runs on the measured mile is the highest ever yet recorded by any vessel for Her Majesty's navy on the Admiralty official trial, and, seeing that the speed of the engines was only 361 revolutions per minute, there seems no likelihood of there being any difficulty in maintaining this at future times when the vessel is in commission.

We are indebted to Engineering for the foregoing particulars, and to the Engineer for our engraving, which is from a photograph of the vessel taken when going at highest speed.

THE FESTIVAL OF ATHLETES IN BRESLAU.

Every four or five years there is a review of the disciples of Jahn, in the form of a universal German "Turnfest," or festival of athletes. The eighth of these festivals was held in Breslau from the 21st to the 25th of July, and was attended by thousands of athletes from all parts of Germany and other European states, and even from far-off America. About 12,000 guests marched from the railroad station through the richly decorated streets of the Silesian capital. In the southern part of the city, at the end of the beautiful Kaiser-Wilhelm Street, is a fine square of twenty-nine acres, that was given up to athletic sports during the festival. On the south side of this square a fine hall was erected which commanded the whole square. It was built entirely of wood, ornamented with towers, and the interior was handsomely decorated. The windows reminded one of painted church windows, but really were only canvas saturated with oil. The first evening there was a fine reception, and the next day a long procession marched through the city. Fifteen thousand men took part in this and about 600 were dressed in fancy costumes, thus varying the monotony which must have prevailed if the procession had been composed entirely of the different clubs in their gymnastic suits. After the procession the athletic sports began with a club swinging performance by 250 men from Saxony. This is shown in the accompanying illustration, for which we are indebted to the Illustrirte Zeitung. There were performances by specially fine gymnasts, and contests of various kinds, including a game of football. On the last afternoon the prizes were distributed, bringing the festival to a happy close.



THE FESTIVAL OF ATHLETES, BRESLAU.

Death from Acid Fumes.

The Druggists' Circular tells of a gentleman of this city who lost his life some weeks since by a rather uncommon accident. In the prosecution of his business he occupied a portion of a building so constructed that to reach a floor occupied by another tenant it was necessary to pass through his premises, and this tenant used large quantities of nitric acid in a manufacturing business in which he was engaged.

While two men were carrying a carboy of this acid through the store of the gentleman mentioned it was broken in front of his private office. As the fumes became manifest all other persons in the vicinity fled, but the gentleman, fearing that fire would result, insisted on remaining and attempting to prevent further damage. This delay proved fatal. He inhaled enough of the deadly vapor to induce such extensive injury of the lungs that he died the next day.

Had the unfortunate man been more familiar with the extreme danger of inhaling the vapor of nitric acid, he would doubtless have escaped with his life, but he evidently failed to understand or realize the fact that its immediate effects are not always its worst ones.

It is doubtful if even many druggists and chemists are fully aware of the risk involved in the inhalation of this or similar corrosive vapors. When any of the liquids from which they may arise happen to be spilled in appreciable quantity, prompt retirement from the scene is necessary to insure escape from severe if not fatal injury.

Preservation of Wood.

The wood is impregnated through its pores under any well known process first with a strong solution of calcium bisulphite and then with a corresponding solution of caustic lime. A monosulphite is formed, which is subsequently oxidized by the action of the air to calcium sulphate, and becomes practically part of the ligneous structure. — A. A. Hely, Westminster, Eng.

Sensitizing Canvas, Silk, and Paper.

A mixture of bromide and iodide of silver is precipitated at a temperature of 28° C. in the presence of a trace of gelatine, and is maintained at that temperature for an hour or so with constant agitation, so as to prevent the precipitate from coagulating. It may then be washed in a centrifugal machine to remove the alkaline nitrate, and is finally well mixed with a cold solution of arrowroot which has been boiled in water till perfectly clear. The fabric or paper to be sensitized is then coated by means of a sponge in the dark room and dried, and if the emulsion has not been washed it is soaked in water for an hour and dried again. Development takes place as for an ordinary gelatino-bromide emulsion. Prints so made lend themselves far more readily to finishing in crayons, oils, or water colors than when the fabric has been coated with an emulsion in gelatine, as there is no fear of the whole film stripping off the canvas. Paper prints made with the arrowroot emulsion may also be finished both with chalk and the brush, which was impossible before, "owing to the impenetrable nature of the gelatine film."—G. J. Junk, Berlin.

The Sea—Its Extent and Depth.

It is hopeless to do more than to briefly sketch the amount of our knowledge.

First, as to the greatest depths known. It is very remarkable, and from a geological point of view significant, that the very deepest parts of the ocean are not in or near their centers, but in all cases are very near land.

One hundred and ten miles outside the Kurile Islands, which stretch from the northern point of Japan to the northeast, the deepest sounding has been obtained of 4.655 fathoms, or 27,930 feet. This appears to be in a deep depression, which runs parallel to the Kurile Islands and Japan; but its extent is unknown, and may be very large.

Seventy miles north of Porto Rico, in the West Indies, is the next deepest cast known—4,561 fathoms, or 27,366 feet; not far inferior to the Pacific depth, but here the deep area must be comparatively small, as shallower soundings have been made at distances sixty miles north and east of it.

A similar depression has been sounded during the last few years west of the great range of the Andes, at a distance of fifty miles from the coast of Peru, where the greatest depth is 4,175 fathoms.

Other isolated depths of over 4,000 fathoms have been sounded in the Pacific. One between the Tonga or Friendly Islands of 4,500 fathoms, one of 4,478 fathoms near the Ladrones and another of 4,428 fathoms near Pylstaart Island, all in the Western Pacific. They all require further investigation to determine their extent.

With these few exceptions, the depth of the oceans, so far as yet known, nowhere comes up to 4,000 fathoms, or four sea miles; but there can be little doubt that other similar hollows are yet to be found.

The sea with the greatest mean depth appears to be the vast Pacific, which covers 67 millions of the 188 millions of square miles composing the earth's surface.

Of these 188 millions, 137 millions are sea, so that the Pacific comprises just one-half of the water of the globe, and more than one-third of its whole area.

The Northern Pacific has been estimated by Mr. John Murray to have a mean depth of over 2,500 fathoms, while the Southern Pacific is credited with a little under 2,400 fathoms. These figures are based on a number of soundings which cannot be designated otherwise than very sparse.

To give an idea of what remains to be done, I will mention that in the eastern part of the Central Pacific there is an area of 10,500,000 square miles in which there are only seven soundings, while in a long strip crossing the whole North Pacific, which has an area of 2,800,000 square miles, there is no sounding at all. Nevertheless, while the approximate mean depth I am mentioning may be considerably altered as knowledge increases, we know enough to say that the Pacific is generally deeper than the other oceans. The immensity, both in bulk and area, of this great mass of water is difficult to realize; but it may assist us when we realize that the whole of the land on the globe above water level, if shoveled into the Pacific, would only fill one-seventh of it.

The Indian Ocean, with an area of 25,000,000 square miles, has a mean depth, according to Mr. Murray, of a little over 2,000 fathoms. This also is estimated from a very insufficient number of soundings.

The Atlantic, by far the best sounded ocean, has an area of 31,000,000 square miles, with a mean depth of about 2,200 fathoms.—Capt. W. J. L. Wharton, R. N., British Association.

Compressed Air at Paris.

The Parisian company for the supply of compressed air has recently erected a new central station elevated on the borders of the Seine, by the Quai de la Gare, at the point where the river enters Paris. The new station is situated under much more favorable conditions than the company's other station in the Rue Fargau, and comprises the latest improvements in this class of plant and machinery. Although only 8,000 horse power is at present in employment, the works have actually been designed for horse power up to 24,000, and the compressed air conduit and system has been constructed with regard to this development. The conduit is made of malleable iron pipe of 500 mm. internal diameter, is of about 16.000 meters in length; it couples the old system of 300 mm. diameter and of 16,500 meters length.

The 24,000 horse power plant will be comprised in three similar groups of four engines of 2,000 horse power and four batteries of multitubular boilers with economizers. The actual working installation, as we have mentioned, is of 8,000 horse power. The boilers are of the Babcock & Wilcox type, made by Creusot under license from the Babcock & Wilcox Company. They are twenty in number, divided into four groups of five boilers. The boilers are registered for a pressure of 12 kilos. per square cm., but will normally be worked at 10 kilos. The heating surface of each boiler is 220·64 square meters. The principal dimensions are: Number of tubes per boiler, 108; length of tubes, 5·400 m.; diameter of tubes, 0·100 m.; heating surface of tubes, 2·182 m. Two chimneys, of 50 m. in height and 3·14 m. diameter at the summit, are used for the twenty boilers. Each group of five boilers is served by an economizer of 53 tubes, constructed by Lemoine d'Allines, which sends the warm water through a Schmid water meter.

The results obtained are most satisfactory. Thus, in ordinary working, with crude coal of 15 per cent ash, a production of 9·2 kilos. steam per kilo. of coal burnt with feed water 72 to 80 c. c. is obtained. Feed water is obtained in the following manner: Each machine possesses two feed pumps drawing injection water from the Seine and emptied in a single collector, which receives equally, by the aid of two small pumps, the warm water of condensation from the jackets and drain cocks of the cylinders, as also from those of the conduit of steam pipes. There are two reservoirs which serve to regulate the pressure. Each reservoir serves two groups of boilers. From these reservoirs the water passes by the meters into the boiler, through the economizers; a by-pass permits the feeding of the boilers directly without utilizing the economizers.

The prime motors are triple expansion, vertical, direct-acting, with three cranks and Corliss valve gear.

The compressors are of Professor Riedler's system, compounded with three cylinders. The compressing cylinders are placed on an extension of the steam cylinders. Bronze safety valves with India rubber clacks are arranged in the domes for the entry and exit of air. These safety and bell valves, which open freely under the action of difference of pressure and the air, are closed mechanically. The compression of air is carried on in two stages. Thus, two cylinders out of the three are disposed for low pressure, and draw external air by openings arranged in the roofing of the engine house. This air passes through air tanks, which serve as supply conduits, at a pressure of 2·5 kilos. into an intermediary reservoir where it is quite cooled, and is then drawn by the third cylinder at high pressure, where it is finally compressed to 6 kilos. This last compression can be pushed to 8 kilos. The normal speed of these engines is 60 revolutions per minute, but they are able to run up to 72 revolutions in case of necessity.

The steam distribution is on the Corliss system, with disengaging out-of-gear on the smaller cylinders on the high pressure, without variation in the point of cut-off for the low pressure cylinders. The regulation of the cut-off in the high pressure cylinders is obtained by hand; independently of this regulation a centrifugal regulator prevents all variations of speed above 72 revolutions, in order to prevent any excessive strain falling upon the moving parts. In the case of an abnormal rise in pressure in the stored air, a special regulator comes into play when this pressure exceeds 8 kilos. These two methods of independent regulation act on the same cut-off apparatus.

This machine is furnished with two flywheels on one shaft, disposed on either side of the main framing. The shafts are arranged in line with one another. The whole of the masonry which supports the steam cylinders, the compressors, the crossheads, etc., is held together by cast iron tie rods. Three floors above one another, in checkered iron plate, supported by steel columns and with railing, with steel steps, run the length of the engine room, and give access to the whole of the machinery.

The plant of air pumps, condensers, feed pumps, and ejector pumps is well disposed below the ground level of the engines in a sump pit, 3·700 m. in depth, quite accessible by stairs and well lighted. This pit runs the whole length of the engines, leading to two rooms where the injector pumps are placed. Under these two rooms four sand and sponge filters have been put in, fed by a counter current, and of which any one can be put in or out of service, so as to obtain pure water. These wells are in communication with the Seine by a tunnel which gives the water required for condensation. The main shafts, the connecting rods, the piston rod, and in general all the pieces forming the engines, are of soft steel from Creusot. All the axles, piston rings, etc., are in special soft steel, treated by cementation and annealed. Dimensions and principal data of the engines:

Normal power of each engine	2,000 h. p.
Number of revolutions per minute	60
Pressure of compressed air	8 kilos.
Pressure of steam in boiler	12 kilos.
Diameter of steam cylinders, high pressure	0·9 m.
" " " middle pressure	1·4 m.
" " " low pressure	2·0 m.
" " compressors low pressure	1·1 m.
" " " high pressure	0·78 m.
Common travel of all pistons	1·4 m.
Diameter of flywheels	5·5 m.
" " air pumps	0·8 m.
Travel of air pumps	0·55 m.
Diameter of intermediary reservoir	1·6 m.
Total length of same	6·8 m.

The total weight of the four engines is 1,800,000 kilos. The large steam cylinders weigh each 30,000 kilos. These engines have very marked economy. As a rule, they consume 0·7 kilo. of coal per I. H. P. In trials they have consumed only 586 grms. This figure, which may perhaps appear exaggerated as a minimum, is due not only to the good and perfect workmanship of the engines, but also to the methodical and carefully adjusted boiler plant, economizers, feed, and utilization of waste water.

The cooling of the air is effected by means of injecting water into the compressing cylinders, and into the intermediary reservoir. This water is retained, as also the air, in two large horizontal reservoirs of steel plate placed one above the other, and having 2 m. diameter and 9·5 m. in length. The higher reservoir carries a tubulure for air entrance, a connection for air with the lower one, and a small connection placed at the lower part to act as a drain cock. The lower reservoir carries two tubulures for air exit and a pocket from which flows the injector water, which, as a result of the air pressure, is lifted into a reservoir placed outside the works, and for this the water runs by a conduit communicating with the aspirating part of the feed pumps and the donkey engines. The injector pumps constructed by the firm of Onillacq & Co., of Anzin, have differential bell valves controlled automatically by the system of Professor Riedler. They are worked by two compound machines having each the following dimensions: Diameter of little cylinder, 0 375 m.; large cylinder, 0·55 m.; common travel of two pistons, 0·600 m.; initial pressure of small cylinder, 7 kilos. These machines are provided with variable cut-off by the regulator for the small cylinder and fixed cut-off by simple adjustment of the slide valve for the larger one. No steam jacket is provided for the small cylinder, but a jacket is provided for the larger one to act as a reservoir for the vapor escaping from the small cylinder and to warm it up at the same time.

The regulator enables one to alter the velocity and regulation from 50 to 80 revolutions per minute by the simple adjustment of a counterweight along a scale. Below 50 revolutions the velocity is regulated by acting by hand upon the steam valve. These machines are furnished with a condenser. The differential pumps are of the following dimensions:

Diameter of small plunger	0·212 m.
" " large "	0·300 m.
Travel of plunger	0·600 m.

They can draw easily from 5 m. depth, and give out at 50 m. mean height, and exceptionally to a hundred. The output of each pump is 100 liters per second. The masonry work and buildings, constructed by Joseph Leclaire, of Paris, have dimensions corresponding to the engine and the boiler which they cover. The engine room has 70 m. length, 16 breadth, and 23·1 high to the tie rods of the roof, the machines having a total height of 12·12 m. above the ground. There has been erected an overhead crane of 40,000 kilos., worked by compressed air, which has been used to lift all the machinery and the large reservoirs.

The boiler house is divided into three rooms, the first having a breadth of 11·3 m. and 10·36 m. high; the second, which serves as the coal store, 8 m. broad by 13·5 height; and the third, 16·05 m. breadth and 10 36 high. At the end of these last buildings there has been erected a mechanics' shop, a boiler shop, a grease store, a repair shop, and a room for dynamos driven by motors for the general lighting of the station. All the inclosures interior of these buildings are only one brick thick, 0·055 m. in breadth. The tubing for steam, compressed air, exhaust, feed water, and injectors has been carefully arranged, and would entail too long a description for us to attempt to give here. It has been constructed by the firm of Bonnet Spazin, of Lyons; the machines, compressors, and boilers have been provided by Creusot. The general design and plans have been due to M. Joseph Leclaire, of Paris, and the buildings from the offices of Montreuil sans Bois.—Industries.

How to Cool a Cellar.

A great mistake is sometimes made in ventilating cellars and milk houses. The object of ventilation is to keep the cellars cool and dry; but this object often fails of being accomplished by a common mistake, and instead the cellar is made both warm and damp. A cool place should never be ventilated, unless the air admitted is cooler than the air within, or is at least as cool as that, or a very little warmer. The warmer the air, the more moisture it holds in suspension. Necessarily, the cooler the air, the more this moisture is condensed and precipitated. When a cool cellar is aired on a warm day, the entering air being in motion appears cool, but as it fills the cellar, the cooler air with which it becomes mixed chills it, the moisture is condensed, and dew is deposited on the cold walls and may often be seen running down them in streams. Then the cellar is damp and soon becomes mouldy. To avoid this the windows should only be opened at night, and late—the last thing before retiring. There is no need to fear that the night air is unhealthful—it is as pure as the air of midday, and is really drier. The cool air enters the apartment during the night, and circulates through it. The windows should be closed before sunrise in the morning, and kept closed and shaded through the day. If the air of the cellar is damp, it may be thoroughly dried by placing in it a peck of fresh lime in an open box, and the National Builder adds, a peck of lime will absorb about seven pounds, or more than three quarts, of water, and in this way a cellar or milk house may soon be dried, even in the hottest weather.

"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.

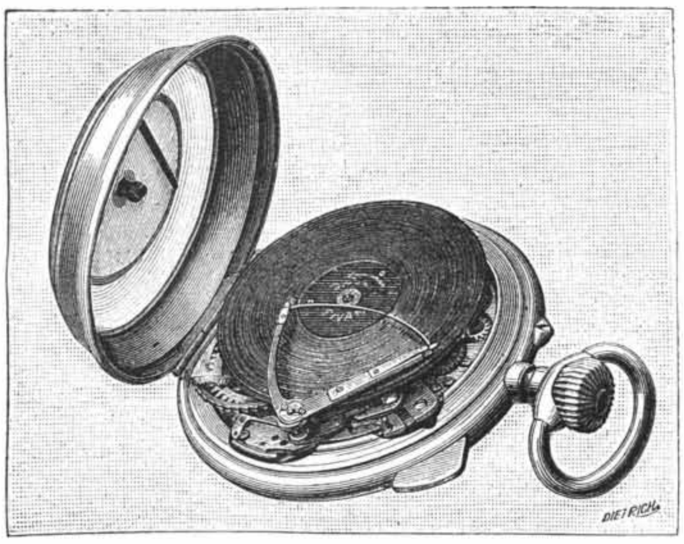


Fig. 1.—SPEAKING WATCH, WITH ITS PHONOGRAPHIC DISK.

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 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.

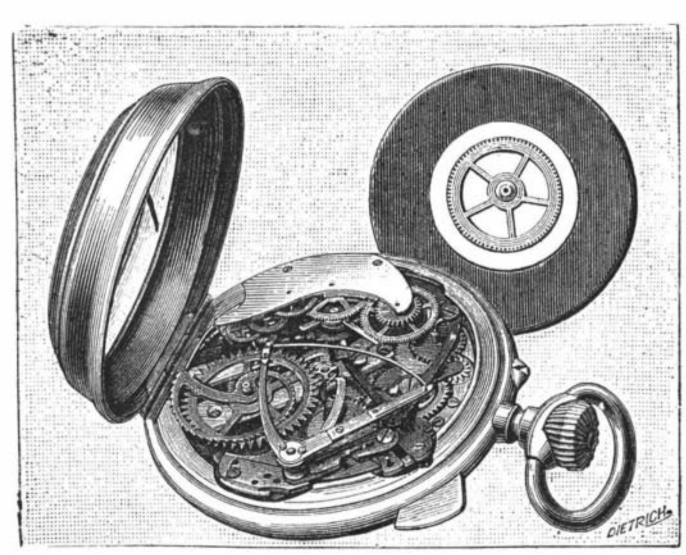


Fig. 2.—SPEAKING WATCH, WITH THE DISK REMOVED, IN ORDER TO SHOW THE INTERNAL MECHANISM.