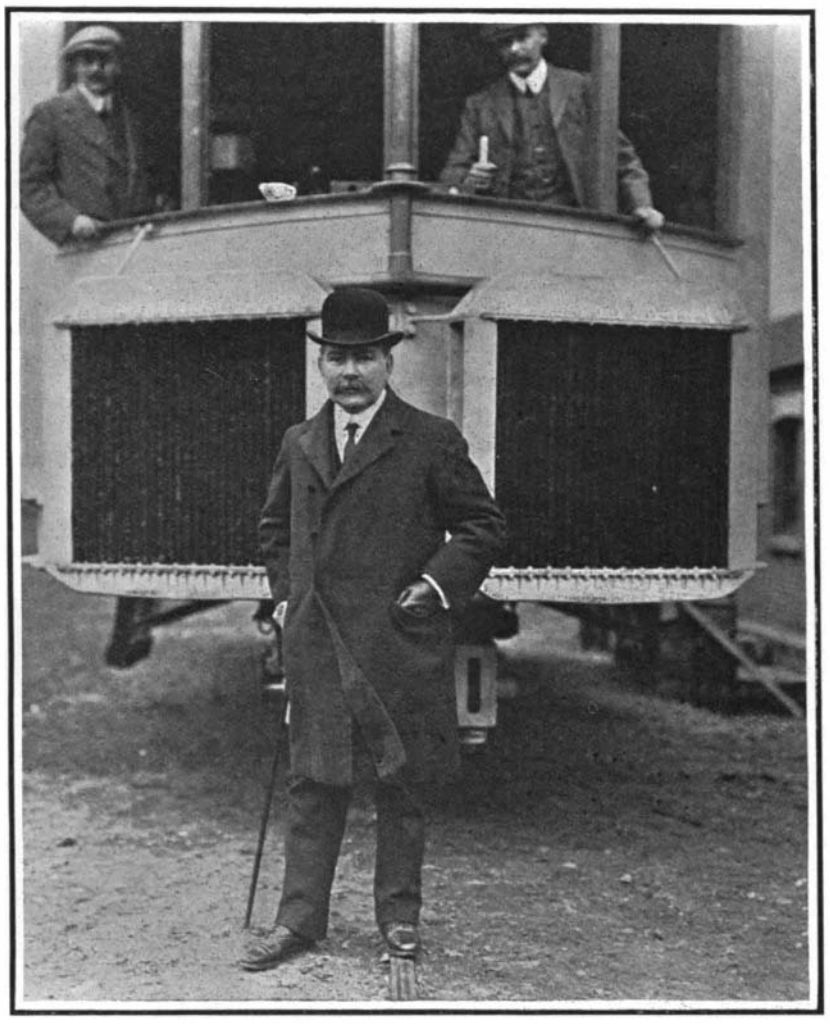
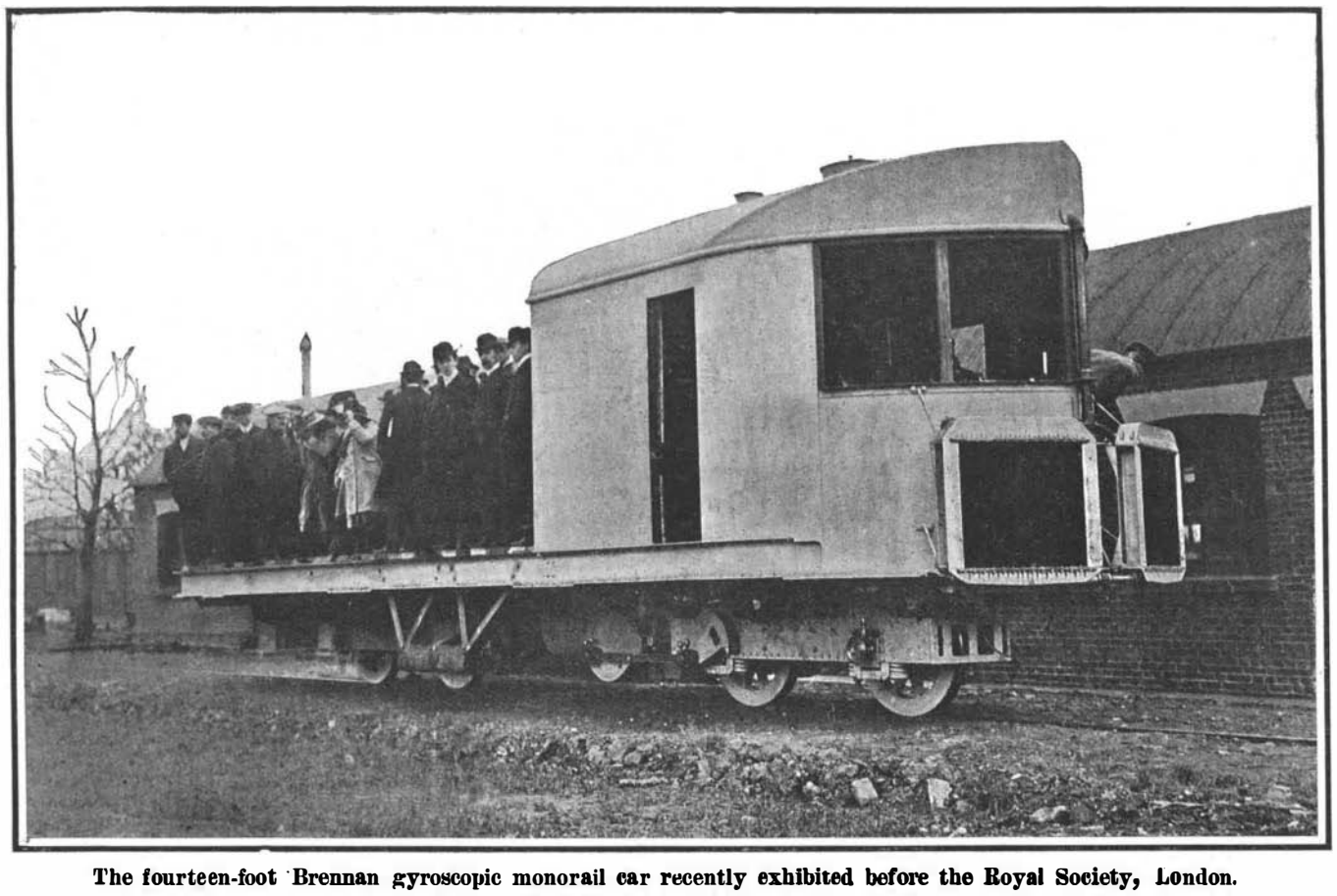
is so constructed that the receptacle for receiving the corn is out of the way, in driving up to the machine with a load. The power is disengaged as well as the rolls by the simple movement of a lever attached to a spiral plug.

THE GYROSCOPIC MONO-RAILROAD.

In the spring of 1907, Mr. Louis Brennan, inventor of the Brennan torpedo, exhibited before the Royal Society of England a small car which traveled on a single rail or cableway, and kept its equilibrium perfectly even while rounding curves and when its load was shifted from one side to the other. This feat, an apparent defiance of the laws of gravity, aroused a great deal of interest, and it was predicted that it marked a revolution in railroad practice. The car was kept in equilibrium by means of a pair of wheels, that were rotated at high speed in opposite directions. The gyroscopic effect of these rotating masses prevented the car from toppling over, in the same way that a top is kept from falling while spinning at high speed. Since the first exhibition of the gyroscopic car, Mr. Brennan has been at work developing details, which would permit of using the same principle on a much larger car suitable for carrying heavy loads. A couple of weeks ago Mr. Brennan's invention, now reduced to practical dimensions, was again exhibited before the Royal Society. The car was 14 feet long, 13 feet high, and 10 feet wide. weighing 22 tons. Carrying a load of 40 passengers, the car traveled on a single rail around a circular track 220 yards in circumference. The balance was perfectly kept by means of two gyroscopes weighing three-quarters of a ton each and revolving at a speed of 3,000 revolutions per minute. The wheels were incased and ran in a vacuum, so as to reduce friction to a minimum. A gasoline engine was used, to keep the gyroscopes spinning and also to propel the car. The car was subjected to the severest of tests, the passengers suddenly shifting from one side to the other in their endeavor to destroy the equilibrium, but the gyroscope wheels responded to the slightest disturbance, and restored the balance at once. One of the difficulties encountered in a car of this type is the precessional action accompanying the gyroscopic motion. This, however, was overcome by means of friction devices. The advantage of using a monorail is that the cost of construction is considerably less; but in addition to this there is the fact that a slight deviation from a true line would result in no damage, whereas when two parallel tracks are used they must both be kept perfectly parallel and in perfect alignment, otherwise the car will run off the track or will rock violently if one side dips below the other. In other words, a double-rail track is more difficult to keep in repair than two monorails, for the reason that the two rails are interdependent, and variation in one must not take place without a corresponding variation in the other. In rounding curves there is always danger of spreading the tracks where a double-rail track is used, while with the monorail line, should the side thrust be sufficient to shift the rail, there would be no tendency for the car wheels to leave the track. As yet the details of Mr. Brennan's latest model have not come to hand, but we expect in an early issue to give our readers a more complete description of this interesting type of railway.



Mr. Louis Brennan standing in front of his gyroscopic monorail car.



The fourteen-foot Brennan gyroscopic monorail car recently exhibited before the Royal Society, London.

THE GYROSCOPIC MONO-RAILROAD.

The Chemistry of Soldering Agents.

BY A. LIPPMANN.

The following summarizes the results of two years' practical experiments with soldering agents, chiefly those of the "soft" type which are suitable for electrical work, where it is necessary for the security of the service to keep within definite limits the resistance introduced and the heat generated at the points of junction. The requirements of mechanical strength, however, demand that the surfaces of contact of the wires shall be sufficiently extended to satisfy the condition of low electrical resistance, and when we consider that ordinary tin and lead solder has a specific resistance 10 or 12 times that of copper, it becomes evident that the chief function of the solder is not to conduct electricity but to protect and maintain the contacts of wire, and to preserve the copper surfaces from oxidation.

There is a traditional belief that hydrochloric acid and other acid soldering liquids should not be used in electrical work, because acid left on the joint by a careless workman may, especially during the passage of a current, give rise to secondary electrolytic actions which will in time destroy the connection. Investigation of many imperfectly soldered joints, however, has failed to indicate any injurious effect due to acids, and has revealed causes of very different character. In most cases of large wires traversed by strong currents, insufficient contact had caused overheating of the joint and fusion of the solder. In some instances the trouble was attributable to the formation of electric arcs between wires which were not held closely together by the solder.

No injury due to the employment of acids could be detected even in resistance coils. With the fine wire used in these coils injuries are far more likely to be caused by careless handling (overheating or burning during the operation of soldering) than by acids.

These considerations lead me to form a lower estimate of the injurious action of acid soldering liquids than is commonly entertained. The investigation in question was undertaken primarily to settle a dispute concerning the relative safety of two soldering liquids, of which one contained ammonium chloride and the other zinc chloride. The difficulty of deciding the question had been increased by the circumstance that an injurious action had been attributed to the hydrochloric acid contained in both soldering agents.

The first requirement for making a good connection by soldering is the presence of absolutely clean metal surfaces. If diluted hydrochloric acid is employed as a soldering liquid a good connection can be made between surfaces not originally quite clean. Many coppersmiths use dilute hydrochloric acid exclusively in fine art work. Experience shows that no injurious after effect need be feared if the soldered joints are well washed with water. The notion that hydrochloric acid is difficult to remove is disproved by the great volatility of the acid. Ammonium chloride (sal ammoniac) is inferior as a flux to hydrochloric acid, and also to zinc chloride and zinc ammonium chloride.

I made experiments in soldering with a preparation of ammonium chloride, to which ammonia was added, drop by drop. The efficiency of the soldering liquid visibly diminished as the proportion of ammonia increased. Soda lye, added to neutralization, made the liquid entirely unfit for use. Hence I attributed the good effect of ammonium chloride to the hydrochloric acid which is gradually separated in the operation of soldering. Experiment showed, however, that ammonium chloride does exert an injurious action on copper. When a mixture of ammonium chloride solution with glycerin was employed in soldering heavy copper cables to each other or to sockets, it was found almost impossible to prevent the liquid from penetrating between the wires of the cable. I examined many such joints two weeks, three weeks, and six months after soldering. In two weeks the wires of the core had become covered with a thick green coating of copper salt. I at first attributed the formation of this salt exclusively to the action of free hydrochloric acid, but Samter has shown that ammonium salts possess a remarkable power of forming complex combinations with copper.

Zinc chloride, zinc ammonium chloride and soldering soaps containing these salts may be regarded as the standard soldering agents. Zinc

(*Concluded on page 399.*)

Home-Made Experimental Apparatus

In addition to the following articles, the Scientific American Supplement has published innumerable papers of immense practical value, of which over 17,000 are listed in a carefully prepared catalogue, which will be sent free of charge to any address. Copies of the Scientific American Supplement cost 10 cents each.

If there is any scientific, mechanical, or engineering subject on which special information is desired, some papers will be found in this catalogue, in which it is fully discussed by competent authority.

A few of the many valuable articles on the making of experimental apparatus at home are given in the following list:

ELECTRIC LIGHTING FOR AMATEURS. The article tells how a small and simple experimental installation can be set up at home. Scientific American Supplement 1551.

AN ELECTRIC CHIME AND HOW IT MAY BE CONSTRUCTED AT HOME, is described in Scientific American Supplement 1566.

THE CONSTRUCTION OF AN ELECTRIC THERMOSTAT is explained in Scientific American Supplement 1566.

HOW TO MAKE A 100-MILE WIRELESS TELEGRAPH OUTFIT is told by A. Frederick Collins in Scientific American Supplement 1605.

A SIMPLE TRANSFORMER FOR AMATEUR'S USE is so plainly described in Scientific American Supplement 1572 that anyone can make it.

A ⅛-H.-P. ALTERNATING CURRENT DYNAMO. Scientific American Supplement 1558.

THE CONSTRUCTION OF A SIMPLE PHOTOGRAPHIC AND MICRO-PHOTOGRAPHIC APPARATUS is simply explained in Scientific American Supplement 1574.

A SIMPLE CAMERA-SHUTTER MADE OUT OF A PASTEBOARD BOX, PINS, AND A RUBBER BAND is the subject of an article in Scientific American Supplement 1578.

HOW TO MAKE AN AEROPLANE OR GLIDING MACHINE is explained in Scientific American Supplement 1582, with working drawings.

EXPERIMENTS WITH A LAMP CHIMNEY. In this article it is shown how a lamp chimney may serve to indicate the pressure in the interior of a liquid; to explain the meaning of capillary elevation and depression; to serve as a hydraulic tournique, an aspirator, and intermittent siphon; to demonstrate the ascent of liquids in exhaustive tubes; to illustrate the phenomena of the bursting bladder and of the expansive force of gases. Scientific American Supplement 1583.

HOW A TANGENT GALVANOMETER CAN BE USED FOR MAKING ELECTRICAL MEASUREMENTS is described in Scientific American Supplement 1584.

THE CONSTRUCTION OF AN INDEPENDENT INTERRUPTER. Clear diagrams giving actual dimensions are published. Scientific American Supplement 1615.

AN EASILY MADE HIGH FREQUENCY APPARATUS WHICH CAN BE USED TO OBTAIN EITHER D'ARSONVAL OR OUDIN CURRENTS is described in Scientific American Supplement 1618. A plunge battery of six cells, a two-inch spark induction coil, a pair of one-pint Leyden jars, and an inductance coil, and all the apparatus required, most of which can be made at home.

SIMPLE WIRELESS TELEGRAPH SYSTEMS are described in Scientific American Supplements 1363 and 1381.

THE LOCATION AND ERECTION OF A 100-MILE WIRELESS TELEGRAPH STATION is clearly explained, with the help of diagrams, in Scientific American Supplement 1622.

THE INSTALLATION AND ADJUSTMENT OF A 100-MILE WIRELESS TELEGRAPH OUTFIT, illustrated with diagrams, Scientific American Supplement 1623.

THE MAKING AND THE USING OF A WIRELESS TELEGRAPH TUNING DEVICE, illustrated with diagrams, Scientific American Supplement 1624.

HOW TO MAKE A MAGIC LANTERN, Scientific American Supplement 1546.

THE CONSTRUCTION OF AN EDDY KITE. Scientific American Supplement 1555.

THE DEMAGNETIZATION OF A WATCH is thoroughly described in Scientific American Supplement 1561.

HOW A CALORIC OR HOT AIR ENGINE CAN BE MADE AT HOME is well explained, with the help of illustrations, in Scientific American Supplement 1573.

THE MAKING OF A RHEOSTAT is outlined in Scientific American Supplement 1594.

Good articles on **SMALL WATER MOTORS** are contained in Scientific American Supplement 1494, 1049, and 1406.

HOW AN ELECTRIC OVEN CAN BE MADE is explained in Scientific American Supplement 1472.

THE BUILDING OF A STORAGE BATTERY is described in Scientific American Supplement 1433.

A SEWING-MACHINE MOTOR OF SIMPLE DESIGN is described in Scientific American Supplement 1210.

A WHEATSTONE BRIDGE, Scientific American Supplement 1595.

Good articles on **INDUCTION COILS** are contained in Scientific American Supplements 1514, 1522, and 1527. Full details are given so that the coils can readily be made by anyone.

HOW TO MAKE A TELEPHONE is described in Scientific American Supplement 966.

A MODEL STEAM ENGINE is thoroughly described in Scientific American Supplement, 1527.

HOW TO MAKE A THERMOSTAT is explained in Scientific American Supplements 1561, 1563, and 1566.

ANEROID BAROMETERS, Scientific American Supplements 1500 and 1554.

A WATER BATH, Scientific American Supplement 1464.

A CHEAP LATHE UPON WHICH MUCH VALUABLE WORK CAN BE DONE forms the subject of an article contained in Scientific American Supplement 1562.

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CHEMISTRY OF SOLDERING AGENTS.

(*Concluded from page 389.*)

chloride preparations are very convenient in use and very reliable, causing the solder to adhere firmly. Even when the surfaces to be joined are greatly oxidized, a good joint can be made by a skillful workman. In order to prevent the possibility of injurious after effects, it is customary to wash the soldered joint with zinc chloride solution. Cable joints made with the aid of zinc chloride were opened and examined after the same intervals of time that were allowed for the joints made with ammonium chloride. Although the zinc chloride also penetrated between the wires the difference in the result was very great. The wires of the core were covered with a dry, wax-like dark green coating, and a substance resembling pitch was found in places where the other ingredients of the zinc chloride soap had been decomposed by overheating, but junctions which had been traversed by strong currents for long periods showed no appreciable increase in resistance.

The assertion that injurious effects are necessarily produced by hydrochloric acid separated by hydrolysis from the hygroscopic zinc chloride was also submitted to the test of experiment. Copper wires less than 1/250 inch in diameter were soldered together and the junctions were covered thickly with the zinc chloride mixture and inserted in an apparatus with which their resistance could be measured while a current was kept flowing through them. In a few days the mixture became moist, but it quickly dried and assumed the wax-like appearance described above. The wires were exposed freely to the air, but observations continued through a long period revealed no deterioration of the joint.

Hence it may be asserted, as the result of exhaustive researches continued for years, that zinc chloride is in every way superior to ammonium chloride as a soldering agent. The inference that ammonium chloride is safe because it is possible to obtain it unmixed with free acid, is a pure delusion, for the injurious action of ammonium chloride on metals is due, not to the comparatively harmless hydrochloric acid, but to the other causes mentioned above.

The extraordinarily good practical effect of zinc chloride preparations, however, still requires explanation.—Zeit. f. Ang. Chemie.

SOUNDING THE OCEAN OF AIR.

(*Continued from page 393.*)

mer, autumn, or winter. Kites and balloons have been sent up from almost every quarter of the earth. Perhaps the most recent of these investigations in an out-of-the-way quarter of the globe is the meteorological expedition to East Africa undertaken by the Royal Prussian Meteorological Observatory. The expedition was conducted by Prof. Berson and Prof. Elias. The chief object was to determine the origin of monsoons, an object which was not altogether attained, but on which much light was thrown. An ultimate aim was the prognosis of the rainy season in East Africa and India. On the coast and from a specially chartered steamer on the lake, *ballons-sondes*, pilot balloons, and kites were sent up. The observations over the equator, in the center of the continent, showed very low temperatures at great heights, as did the expedition of Teisserenc de Bort and Rotch on the equatorial Atlantic, but with the difference that over the African continent there was a trace of the permanent inversion layer. The vertical changes were as follows: adiabatic decrease of temperature to 13,000 meters, between 13,000 and 15,000 meters a small inversion, and above 17,000 meters isothermal conditions. Above the southeast monsoon the wind was south-southwest, and three times a westerly wind was observed between 15,000 and 18,000 meters, above the great equatorial current from the east which is supposed to prevail at all heights.

It was feared that a very large per cent

(*Continued on page 400.*)

Census of Dirigibles and Aeroplanes.

The well-known explorer and sportsman, the Prince Scipio Borghese, has presented to the Chamber of Deputies of Italy a tabulated statement showing the number of dirigibles and aeroplanes in existence in the world on September 30th. The former number 36; the latter, 76. In addition, 68 dirigibles are in course of construction. The number of machines first cited are divided among the different countries as follows:

	Dirigibles.	Aeroplanes.
France	9	27
United States	7	17
Germany	10	6
England	3	6
Belgium	1	5
Italy	3	2
Austria	..	5
Japan	1	3
Russia	2	1
Switzerland	..	2
Spain	..	2

The dirigibles are divided as follows into military and private ones:

	Military.	Private.
Germany	7	3
France	4	5
United States	2	5
England	2	1
Italy	1	2
Russia	2	..
Belgium	..	1
Japan	1	..

The census of dirigibles under construction is as follows:

	Military.	Private.
Germany	8	7
France	5	10
United States	4	7
England	4	1
Italy	2	3
Russia	4	..
Japan	2	1
Belgium	1	2
Austria	1	2
Spain	2	..
Switzerland	1	1

The number of aeroplanes which are known to exist are parceled among the different nations as follows:

France	27	Japan	3
United States	17	Switzerland	2
Germany	6	Italy	2
England	6	Spain	2
Austria	5	Russia	1
Belgium	5		

France, which possesses more than-one-third of the aeroplanes in existence, is therefore considerably farther advanced than the other nations in this respect.

The Life of the Infinitely Small.

A few years ago Prof. Metchnikoff ingeniously projected upon the screen the struggle of the red and the white corpuscles in the blood. The spectacle was highly entertaining, but unfortunately lasted but a few seconds, for which reason the application of the process was exceedingly limited.

Thanks to a new apparatus recently devised by Dr. Comandon, and exhibited before the Academy of Sciences by Prof. Dastre, the moving-picture machine is made to give an enlarged view of the small microbes in activity. Briefly stated, Comandon has devised a method of employing the ultramicroscope for the purpose of photographing microscopic life on a moving-picture film.

The ultramicroscope, which has been more than once described in the columns of the SCIENTIFIC AMERICAN SUPPLEMENT, is not essentially different from any other microscope, except in the method of lighting the object to be utilized. In an ordinary microscope the light passes through a glass plate which supports the object, and thence travels to the eyepiece. Infinitely small objects are literally drowned in this brilliancy, and are therefore invisible. Their luminous intensity is not sufficiently different from that of the ambient light. With such an ordinary microscope it is impossible to study objects smaller in diameter than one-half a micron—a micron being equal to the thousandth part of a millimeter. The ultramicroscope comprises the same arrangement of lenses as an ordinary microscope. Instead of illuminating the object from below and normally to the plane of the stage, the object is illuminated from the side or obliquely, so that the light rays fall only on the slightly elevated object, and therefore leave everything else in obscurity. This result is obtained by a simple system of prisms and lenses.

Without entering into technical details, it may be said that with an ordinary microscope the eye is transported into a chamber bathed with sunlight. With the ultramicroscope the eye is transported to a dark room traversed by a single ray of light, so that it renders visible dust particles which otherwise would be invisible if the room were regularly illuminated. Hence the ultramicroscope renders it possible to distinguish microscopic objects measuring not more than 1/100th of a micron in diameter, or 1/100,000th of a millimeter.

Comandon has succeeded in combining the ultramicroscope with the moving-picture machine to register upon a photographic film the life history of many infinitely small microbes. Among the more interesting films which were thrown upon the screen during Dr. Dastre's discourse before the Academy was one showing the struggles of the white and the red corpuscles in the blood. The red corpuscles appeared as black globules outlined with white, and the white corpuscles appeared as white splashes. The picture of the corpuscles filed past at the rate of 960 a minute, each having been taken in about 1/32nd part of a second. The moving picture film views appeared on the screen magnified from 10,000 to 20,000 diameters. An inch seen under these conditions would seem about as high as a six-story house. The ultramicroscope moving-picture machine will undoubtedly render excellent service in biology, because it will register certain phenomena which at present cannot be studied.

It may be stated without in the least detracting from the work of Dr. Comandon that similar results have been already obtained by an English naturalist, Mr. Mark Duncan. Furthermore, Mlle. Cheroton (the collaborator of Prof. Franck of the College de France) and M. Vies have also chromophotographically studied the segmentation of sea urchins' eggs in the biological laboratory of Rocsoff.

Ephemeris of Halley's Comet.

A letter has been received at Harvard Observatory from Father G. M. Searle, C.S.P., of New York, giving the following "Continued Ephemeris of Halley's Comet. T assumed to be Apr. 19 d. 692 G. M. T."

EPHEMERIS.

Gr. Mean Noon. 1909.	R. A. (1909.0) h. m. s.	Dec. Deg. Min.	Log. Δ	Br. (Sept. 11=1.)
December 1	4 27 54	+ 15 53.8		
December 3	4 19 47	+ 15 43.3	0.160	12
December 5	4 11 24	+ 15 31.7		
December 7	4 2 50	+ 15 19.0	0.148	13
December 9	3 54 8	+ 15 5.0		
December 11	3 45 20	+ 14 49.5	0.139	14
December 13	3 36 28	+ 14 33.2		
December 15	3 27 35	+ 14 15.9	0.134	15
December 17	3 18 45	+ 13 57.8		
December 19	3 10 1	+ 13 39.0	0.132	16
December 21	3 1 25	+ 13 19.7		
December 23	2 52 58	+ 13 0.1	0.134	17
December 25	2 44 45	+ 12 40.4		
December 27	2 36 48	+ 12 20.6	0.138	17
December 29	2 29 7	+ 12 1.0		
December 31	2 21 41	+ 11 41.9	0.145	18

Pseudo Blood Oranges.

It sometimes happens that a physician leaves absentmindedly in the tissues of his patient one of those fine needles which terminate the Pravaz syringe, be it by some wrong manipulation, or because of some awkward movement by the patient.

In such a case the treatment is very simple. One simply says nothing about it, and the patient does not notice it. The accident is of no consequence; the needle is not absorbed—of this there is no doubt—but proceeds leisurely through the tissues to some other point of the body.

Unfortunately it is not so much that trouble may arise by this behavior of Pravaz needles, and that pain may be caused thereby, as it is that they may be brought about *secundum artem*. We find an example in the Presse Medicale.

Blood oranges are often, it appears, "faked," at least in northern climes, where they command a higher price than the ordinary orange.

In order to transform these latter into blood oranges, certain "manufacturers" inject into the orange, through the rind, with the aid of a syringe provided with a fine needle, a solution of red aniline dye mixed with a saccharine solution. Now, recently, in St. Petersburg, a lady bought from a fruit merchant a dozen of these pseudo blood oranges. She gave one to her little daughter, but was distracted to find on putting the first piece into her mouth that she was attacked by a sharp pain in the region of the pharynx and spat blood. A physician being hurriedly called diagnosed the pain and hemorrhage as having been caused by a fragment of a needle which had lodged in the mucous membrane of the pharynx. When this fragment was extracted it proved to be a point of a Pravaz needle, in the eye of which was found a small remaining portion of aniline color.

On returning to the orange dealer, he revealed that the "dodge" is often resorted to in manufacturing blood oranges.—Cosmos.

Wireless Telegraphy in the Antarctic.

The new expedition which is being fitted out in England to go to the South Pole, it is proposed to maintain in communication with the civilized world during the entire course of its exploration. Wireless telegraph apparatus will be installed on the "Nimrod," the ship of the expedition, which will serve as a base, and other apparatus will be carried by the different exploring parties, so that they can remain always in communication, more or less directly, with New Zealand.

Uranium in the United States.

Uranium is found commercially in only two minerals in the United States, pitchblende and carnotite. Pitchblende, which is widely known because of its use as an ore of radium, occurs in quantity in the United States only in Gilpin County, Colo., where there are four mines that produce it. Carnotite occurs as a bright yellow powder in sandstones in Utah and Colorado.

Uranium minerals are radioactive, and their radioactivity may be tested by their effect upon a photographic plate, which will show shadows of metallic objects placed between it and a specimen of uranium mineral.

Uranium has not yet been put to many practical uses. It is said to be used in steel making in Germany. Uranium salts are used in iridescent glass and in pottery glazes, and uranium compounds are employed in chemistry and in medicine. A number of the uranium salts are violent poisons. Uranium and uranium salts were imported into the United States in 1908 to the value of $7,145, according to F. L. Hess, of the United States Geological Survey, whose report on uranium and other rare metals is published by the Survey as an advance chapter from "Mineral Resources of the United States, calendar year 1908."

Serviceability and Cleanliness of Alcohol.

Where the restrictions placed on the use of denatured alcohol are less stringent than those placed on the use of gasoline, or where safety and cleanliness are important requisites, the advantages to be gained by the use of alcohol engines in place of gasoline engines may overbalance a considerable increase in the fuel expense, especially if the cost of fuel is but a small portion of the total expense involved. Denatured alcohol will, however, probably not be much used for power purposes until it becomes as cheap as gasoline and until the equality of gasoline and alcohol engines in respect to adaptability to service required and quantity of fuel consumed per brake horse-power becomes more generally realized.

In regard to general cleanliness, such as absence of smoke and disagreeable odor, alcohol has many advantages over gasoline or kerosene as a fuel. The exhaust from an alcohol engine is never clouded with black or grayish smoke, as is the exhaust of a gasoline or kerosene engine when the combustion of the fuel is incomplete, and it is seldom, if ever, clouded with bluish smoke when a cylinder oil of too low a fire test is used or an excessive amount supplied. The odor of denatured alcohol and the exhaust gases from an alcohol engine are also not likely to be as obnoxious as the odor of gasoline and its products of combustion.

Wireless Telegraphy in Airships.

The German airship "'Gross II." is provided with wireless telegraphic apparatus. According to newspaper accounts, good results have also been obtained with wireless apparatus on the "Zeppelin III." This announcement is especially gratifying, because doubts had been expressed concerning the advisability of attempting wireless communication with Zeppelin airships, on account of the danger of fire. The Zeppelin airship, unlike those of Parseval and Gross, has a metallic skeleton which is a good electrical conductor, and it is also exposed to the danger of an accumulation of an explosive mixture of gases in the space between the gas bags and the outer skin.

The Current Supplement.

An interesting aerial cableway and ore-handling plant in New Caledonia is described in the opening article of the current SUPPLEMENT, No. 1769. The desirability of fitting the farm dwelling with good plumbing fixtures and of installing a modern lighting system and economical heating appliances, is pointed out in an excellent article on the subject entitled "Heating the Farm House." Some simple practical inventions are enumerated—among them an automatic vulcanizer for automobile tires, a wrench with interchangeable disks, a wrench with tube for operating in corners, a dragon-fly boomerang, and washing machines. A short but interesting article is that which describes a box with a secret drawer and recesses. The Paris correspondent of the SCIENTIFIC AMERICAN contributes a description of Berjonneau's system of telephotography. Machines for making cordage are described and illustrated. The development of the gas engine is historically traced. Those interested in the return of Halley's comet will find in the current SUPPLEMENT a good ephemeris which gives the position of the comet up to December 26th. Copper-clad steel is a metallurgical novelty which is described at some length. Modern railroad-bed construction and track-grading machinery is described by F. C. Perkins. Victor de Beauclair writes on ballooning over the Alps. Alfred Russel Wallace, Darwin's coworker in the field of evolution, writes on the world of life as visualized and interpreted by Darwin. The Engineering, Electrical, and Trade Notes are published as usual.