the machine, it is only necessary to close the valve, H, and apply the brake in the usual way.

The engine cylinders are 3$\frac{1}{16}$ inches in diameter, with a stroke of 4$\frac{5}{8}$ inches. The supply and exhaust valve apertures are $\frac{1}{8}$ inch in diameter. The benzine reservoir is 13 inches long and 7$\frac{1}{8}$ inches in diameter. The driving wheel is 22 inches in diameter and the guiding wheel is 26 inches in diameter. The pneumatic tires are made specially large and heavy to support the weight of the machine and rider. The tread of the machine is 4 feet; weight when in running order, 115 pounds.

The reservoir contains a supply of benzine sufficient for a run of 12 hours. The machine is able to run at a speed of from 3 to 24 miles per hour.*

MODERN APPLICATIONS OF THE STORAGE BATTERY.

BY WILLIAM BAXTER, JR.

The storage battery came into the world with such a flourish of trumpets, and failed so completely to accomplish all that was expected of it, that for a long time it rested under a heavy cloud. The sensational press, ever ready to exaggerate the possibilities of new inventions, made claims for it that were far beyond the limits attainable, even by theoretical perfection, and those engaged in promoting its interests, either through ill advice, or an over-sanguine estimate of its capabilities, subjected it to the most trying tests, believing, no doubt, that if it succeeded in these, its future would at once be established on a firm foundation. The results of these tests, as every one knows, were disastrous, and, during the following years, those who spent their time and money in endeavors to improve upon the work of the past were looked upon as impracticable dreamers. But through the efforts of these men very decided improvements have been made, and the batteries of to-day are thoroughly practical and reliable, for a certain line of work, although they have not reached that point of perfection where they can be used with success for the purposes to which they were first applied; that is, for the propulsion of railway cars.

At the present time it is considered by those who have given the subject the most thought that storage batteries can be used advantageously in several ways; they can be used to equalize the load in lighting and power stations, to keep up the electrical pressure at the end of long transmission lines, to increase the capacity of a station, and to reduce the cost of transmission lines, by acting as transformers. To equalize the load and to increase the capacity of stations they are now used quite extensively, and are gaining a foothold in this field with remarkable rapidity. Among the larger stations where they are used for one or the other of these purposes may be mentioned: The Edison Illuminating Company, of New York City; the Hartford Electric Company (which is installing the largest plant in the world, at the present time; its capacity being nearly four thousand horse power); the Union Traction Company, of Philadelphia; the Boston, and the Lawrence, Massachusetts, Electric Illuminating Companies.

The advantages to be derived from the use of storage batteries in power and lighting stations, from an economic point of view, arise from the fact that the load upon the engines varies within very wide limits, at different times of the day, and as a consequence the average output of the plant is considerably below the full capacity. This causes a loss in two ways, one of which is through the inability to utilize the full capacity of the machinery and the other through the reduced economy of the engines, due to the fact that they must work nearly all the time at an output far below that which gives the highest efficiency.

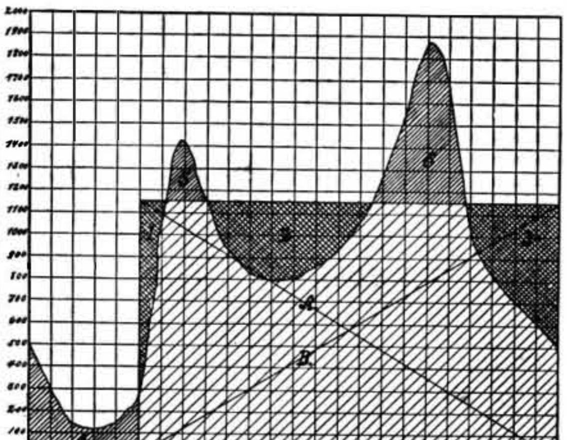
In an electric lighting station the greatest demand for power is between the hours of six and seven P. M. and the next greatest between about the same hours in the morning. During the balance of the time the consumption is much lower, and after midnight it falls off to very nearly nothing. If steam engines alone are used, their capacity must be sufficient to meet the greatest demand, even if that only lasts for a few minutes; but, if storage batteries are added to the plant, these can be depended upon to take care of the excessive demands, and then the engine capacity can be considerably reduced.

The gain that can be effected by resorting to this expedient is more clearly shown in the accompanying diagram, which represents the condition of current demand in a station which, with steam engines alone, would require a capacity of about two thousand horse power, and if provided with storage batteries, would require something less than 1,200 horse power. Starting from the left side of the diagram it will be seen that at midnight the demand is about 500 horse power, and this drops to a little over one hundred by two o'clock. At five it takes a sudden start and passes above fourteen hundred at seven o'clock, and then drops rapidly again until noon, when it is about eight hundred. From this time on until six P. M. the demand constantly increases, and reaches a maximum of nearly 1,900 horse power.

This curve would represent the average consumption of power, taking one day with another, but on special occasions the demand would be greater; therefore, at least two thousand horse power engine capacity would be required to successfully meet all demands. As can be seen from the diagram, the output for more than nine-tenths of the time would be very far below the full capacity of the engines, and, as a consequence, the efficiency would be low. The total area of the diagram represents the power the engines could furnish if worked to their full capacity, all the time, and the portion below the curve line the amount of power that is actually developed. This latter portion, it will be seen, is less than one-half of the whole; hence, the average supply, from which a revenue is obtained, is less than half the capacity of the plant.

Besides the inability to utilize the full capacity of the plant, there are two other serious objections to this arrangement. One is that, if anything goes wrong with the machinery and it becomes necessary to shut down, the lights will go out; the other is that a portion of the plant must be kept in operation at all times. To be able to accomplish this, it is customary to have reserve engines and generators, but this simply means more idle machinery.

By the use of storage batteries, the conditions can be greatly improved, as an engine capacity of about 1,150 horse power working continuously for about seventeen hours per day would furnish all the power required. The rectangle, of which A and B are the diagonals, represents this constant output, and the shaded portions of it, marked 1, 2, and 3, show the power that would be charged into the batteries, during the hours when the demand runs below the engine capacity and also the time when the charging takes place. The shaded parts, 4, 5, 6, outside of the rectangle, A, B, represent the power furnished by the batteries when the demand is greater than the engine capacity or the latter are shut down. The section 4 shows the power that is supplied while the engines are shut down and 5 and 6 the power supplied when the demand runs above the capacity of the engines.



GAIN BY THE USE OF STORAGE BATTERIES.

As there is a loss in charging and discharging the batteries, the energy put into them must be greater than that taken out, that is, the sum of the shaded portions, 1, 2, 3, must be greater than that of 4, 5, 6; but, for all that, the arrangement is decidedly advantageous, because the capacity of the engines and electric generators can be reduced to about one-half, and the plant can be shut down for a period of from four to five hours every night, thus giving ample opportunity to make necessary repairs.

From the foregoing it will be seen that the use of storage batteries in connection with lighting and power stations is beneficial in the highest degree. Not only is the cost of operation greatly reduced, but the reliability of the service is materially increased, for if at any time it becomes necessary to stop the machinery, the batteries can keep up the supply until it is started up again, that is, if the time of the shutdown does not exceed two or three hours, and it is very seldom that anything happens that requires a stoppage of more than a few minutes. In addition to the advantages mentioned in the foregoing, if a station becomes too small to meet the demands upon it, its capacity can be nearly doubled by the installation of a battery plant, and the increase can be made still greater if the engines are shut down only two or three hours every night, instead of five, as between the hours of 1 and 5 A. M. nearly all the power could be stored.

In Europe the storage battery is used in stations to a far greater extent than here, where, until within the past year or so, it has made but little headway. Now, however, it is gaining very fast, and before long will, no doubt, be considered an indispensable adjunct in all stations.

* In SUPPLEMENT 998 is contained an illustrated description of a slightly different form of motor cycle.

THE output of petroleum in Java has been considerably increased lately, but it is expected that with an improved plant the production may still be doubled. The Dordrecht Company owning the oil wells is in a very prosperous condition, having been able to declare dividends up to 62 per cent.—Uhland's Wochenschrift.

What Can be Done with Salt.

Salt cleanses the palate and furred tongue, and a gargle of salt and water is often efficacious. A pinch of salt on the tongue, followed ten minutes afterward by a drink of cold water, often cures a sick headache. Salt hardens gums, makes teeth white and sweetens the breath. Cut flowers may be kept fresh by adding salt to the water. Weak ankles should be rubbed with solution of salt, water and alcohol. Rose colds, hay fever and kindred affections may be much relieved by using fine dry salt, like snuff. Dyspepsia, heartburn and indigestion are relieved by a cup of hot water in which a small spoonful of salt has been melted. Salt and water will sometimes revive an unconscious person when hurt, if brandy or other remedies are not at hand. Hemorrhage from tooth pulling is stopped by filling the mouth with salt and water. Weak and tired eyes are refreshed by bathing with warm water and salt. Public speakers and many noted singers use a wash of salt and water before and after using the voice, as it strengthens the organs of the throat. Salt rubbed into the scalp or occasionally added to the water in washing prevents the hair falling out. Feathers uncurled by damp weather are quickly dried by shaking over a fire in which salt has been thrown. Salt always should be eaten with nuts, and a dessert fruit salt used should be specially made.

If twenty pounds of salt and ten pounds of nitrate of ammonia be dissolved in several gallons of water and bottled, many fires may be prevented. By splashing and spraying the burning articles the fire is soon extinguished. An incombustible coating is immediately formed. Add salt to the water in which black and white cotton goods are washed. Flatirons may be made smooth if rubbed over salt. Copper and glass may be quickly cleansed by dipping half a lemon in fine salt, then rubbing it over stained objects. Lemons and salt also remove stains from the fingers. Do not use soap afterward. If a small teaspoonful of salt be added to a quart of milk it will be preserved sweet and pure for several days. A pinch of salt added to mustard prevents it souring. A smouldering or dull fire may be cleared for broiling by a handful of salt.

Salt thrown on any burning substance will stop the smoke and blaze. Bread insufficiently salted becomes acid, dry and crumbles. Bread made with salt water is said to be good in some cases of consumption. When cabbages, onions or strong smelling vegetables have been boiled in pans, to prevent odors clinging to them place some salt on the stove and turn the pans bottom up over the salt. In a few minutes the pans will smell sweet.

All salads should be soaked in salt and water to destroy animalcules or small worms. Make a strong brine, and water garden walks to kill weeds. A moderate quantity of salt stimulates their growth. Salt and camphor in cold water is an excellent disinfectant in bedrooms. Housemaids should pour salt water, after using it, down the drain pipes. Sewer gas is counteracted by a handful of salt placed in toilet room basins. Water for laying dust is more effective when salt is added. Sea water is generally used in English coast towns for this purpose.

Rattan, bamboo and basket work furniture may be thoroughly cleaned by scrubbing with brush and salt water. Japanese and plain straw matting should be washed with salt and water and rubbed dry. This keeps them soft and prevents brittle cracking where traffic is heavier. Brooms soaked in hot salt water wear better and do not break. Bedroom floors may be kept cool and very fresh in summer if wiped daily with a cloth wrung out of strong salt water. All microbes, moths and pests are thus destroyed. Black spots on dishes and discolorations on teacups are removed by damp salt.—Philadelphia Ledger.

The Lead Tree.

The difference in the strength of the affinity existing between different substances may be easily illustrated by the following experiment: Dissolve an ounce of acetate of lead (" sugar of lead ") in a quart of water and fill a glass jar with the solution. If a piece of zinc (or a few spirals of the same metal) be now suspended in the liquid, it will, after a short time, become covered with a gray coating, from which brilliant metallic spangles will shoot forth somewhat in the shape of a tree. These are pure lead, and the phenomenon is familiarly known as the " lead tree." The effect thus produced is due to the superior affinity of the zinc for the acetic acid conbined with the lead, and which causes the two metals to interchange places—the zinc combining with the acid and entering into solution and the lead being deposited in the metallic state in place of the zinc. If the action be kept up long enough, every particle of lead may in this way be withdrawn from the liquid.

This pleasing experiment is greatly dependent upon electro-chemical action. The first portions of the lead form with the zinc a voltaic arrangement of sufficient power to dissolve the salt. Under the peculiar circumstances in which the latter is placed, the metal is precipitated upon the negative portion (the lead), while the oxygen and acid are taken up by the zinc.

The Form of the Head as Influenced by Growth.

The change in the shape of the head which accompanies growth has been but very slightly investigated either in this country or abroad. The meagerness of results may be indicated by the fact that Topinard's Elements d'Anthropologie contains only a note upon the subject, with no data. A recent investigation upon the students of the Massachusetts Institute of Technology may be of interest as bearing upon this question. The measurements covered 485 students, grouped as follows: 215 in the first year class; 69 in the second; 66 in the third, and 136 in the graduating class.

From the comparison of the measurements of the length and breadth of the heads of these students so divided into classes, it appears that between the period of entrance and of graduation, that is to say from the ages of 18-19 to 23-24 years, the development of the head is almost entirely in respect of its length. The average breadth of the head remaining constant at or near 152 mm., the length varies from an average of 195·13 mm. in the first year to 196·35 in the fourth year class. The intermediate classes occupy a position midway between the two, indicating that this is not a result of chance. If this tendency be a general one, it means that the cephalic index in our American population of this class tends to decrease at this particular time of life. The cephalic index, for example, of the first year students averages 78·6 and that of the fourth year averages 77·2, the second and third years being 77·7. This is rendered specially significant by the fact that Drs. West and Porter have shown a slight decrease of cephalic index in American school children between the ages of 5 and 18; at Worcester, for example, the average index falling between 79 and 78.* If we assume that in both cases we are dealing with similar populations the hypothesis of a progressive decrease of cephalic index, with growth, of our American people would seem to be well founded.

In Europe, Zuckerhandl, comparing the index of 156 children and 197 adults of the same (Austrian) race, found that the children were narrower headed than adults as a rule; and Holl confirms this result.† Dr. Meis declares that from his experience the children among the Germans are more dolicho-cephalic than the adults.‡ Schaafhausen finds that in many cases the length of the head is attained before the full breadth.§ In Italy, Dr. Livi has brought together the results of a number of observers from both northern and southern Europe, but all of them from the broadheaded races.‖ The difference of cephalic index on the average among 447 cases here amounts to one unit in favor of broadheadedness of the adult, the contrary tendency to that noted for the Americans. That age brings a relative increase in the breadth of the head was also apparently indicated by the few measurements made by Welcker.¶ For Bohemia, Dr. Matiegka, from measurements on 400 children, asserted that there is no tendency toward a change in the relative length and breadth in the cases observed by him.** Dr. Boas finds that in the North American Indians age is characterized by a relative increase in the length.††

On the whole, summarizing the results and opinions of these various writers, whose conclusions are, on the whole, contrary to our American ones, it appears that no universal rule can be established with respect to the effect of age upon the proportions of the head. The only hypothesis which seems to be confirmed by all this evidence is that development brings an approximation to the racial type most clearly marked in the adult. In other words, in the narrowheaded races, like our own, the children are broader headed than the adults. Among the brachy-cephalic races, such as those instanced by Dr. Livi and most of the others cited, the children exhibit the race peculiarity in a less marked degree, that is, they are relatively narrower headed than at maturity. Finally the change from childhood to maturity becomes nil where the adults themselves belong to a group with a cephalic index near the mean for the entire European race. No relation can be established between the intelligence and the proportions of the head so far as the experience of European study goes, although Krause and Virchow declare in favor of the broadheaded type. If this hypothesis be true that age brings the fuller development of the race type, it may be possible in the future to apply a correction to the comparative results obtained by students of anthropology whose results are drawn from the study of children. But until that time the inferences to be drawn from such study are as likely to be erroneous as are conclusions drawn from the study of the color of the hair and eyes of school children, since in both cases maturity brings a change which has not as yet been statistically measured. It is earnestly hoped that further study along this line may be undertaken. The testimony of expert psychologists would be also of interest as bearing upon this point. In the hope of stimulating some such investigations, the modest results obtained from this study at the Institute of Technology are submitted.—W. Z. Ripley, in Science.

* Archiv fur Anthropologie, xxii, pp. 19 and 34; and Report of Anthropological Congress at Chicago, p. 57.

† Mitt. der Anth. Gesell. in Wien. xiv, 1884, p. 127; and Ibid. xviii, p. 4.

‡ Ibid., xx, 1890, p. 39 seq.

§ Uber die Urform des Menschlichen Schadels, in report of Congres Int. d'Anth. et d'Archæologie, Paris, 1867.

‖ L'Indice Cefalico degli Italiani, Florence, 1886, p. 15.

¶ Archiv. fur Anthropologie, I, p. 151.

** Mitt. der Anth. Gesell. in Wien, xxii, 1892, Sitzungsberichten, p. 81.

†† Verh. der Berliner Gesell. fur Anth., Sitzber. May 18, 1895, p. 392.

The Commonest Names.

These are the fifty most common surnames of the babies born in England and Wales, in Scotland, and in Ireland, arranged in the order of their numerical importance:

	England and Wales.	Scotland.	Ireland.
1	Smith	Smith	Murphy.
2	Jones	McDonald	Kelly.
3	Williams	Brown	Sullivan.
4	Taylor	Thomson	Walsh.
5	Davies	Robertson.	Smith.
6	Brown	Stewart	O'Brien.
7	Thomas	Campbell	Bryne.
8	Evans	Wilson	Byrnes.
9	Roberts	Anderson	Connor.
10	Johnson	Scott	O'Neill.
11	Wilson	Miller	Reilly.
12	Robinson	McKenzie	Doyle.
13	Wright	Reid	McCarthy.
14	Wood	Ross	Gallagher.
15	Thompson	McKay	Doherty.
16	Hall	Johnston	Kennedy.
17	Green	Murray	Lynch.
18	Walker	Clark	Murray.
19	Hughes	Paterson	Quinn.
20	Edwards	Young	Moore.
21	Lewis	Fraser	McLaughlin.
22	White	McLean	Carroll.
23	Turner	Henderson	Connolly.
24	Jackson	Mitchell	Daly.
25	Hill	Morrison	Connell.
26	Harris	Cameron	Wilson.
27	Clark	Watson	Dunne.
28	Cooper	Walker	Brennan.
29	Harrison	Taylor	Burke.
30	Ward	McLeod	Collins.
31	Martin	Ferguson	Campbell.
32	Davis	Duncan	Clarke.
33	Baker	Gray	Johnson.
34	Morris	Davidson	Hughes.
35	James	Hunter	Farrell.
36	King	Hamilton	Fitzgerald.
37	Morgan	Kerr	Brown.
38	Allen	Grant	Martin.
39	Moore	McIntosh	Maguire.
40	Parker	Graham	Nolan.
41	Clarke	White	Flynn.
42	Cook	Allan	Thompson.
43	Price	Simpson	Callaghan.
44	Phillips	McGregor	O'Donnell.
45	Shaw	Munro	Duffy.
46	Bennett	Sinclair	Mahony.
47	Lee	Bell	Boyle.
48	Watson	Martin	Healy.
49	Griffiths	Russell	Shea.
50	Carter	Gordon	White.

—From the Pall Mall Magazine.

Screws in Stone Walls.

A Dusseldorf engineer, knowing from experience that wooden dowels for the purpose of securing screws in stone are apt to weaken the walls and do not afford the desired solidity, has devised an ingenious method of obtaining a firm anchorage. For this purpose a wire of suitable thickness is coiled on to the screw, so as to follow the threads of the same and to form a kind of screw nut. The coiling may commence near the head or thick end of the bolt and proceed toward the point by laying the wire into or between the threads, so as to touch the bottom of the same, the section of each screw thread being preferably triangular or trapezoidal and the core of the screw conical (similar to a wood screw). After arriving at the point of the screw the wire may be wound backward over the helix already wound on, but with a steeper pitch, so as to leave wider interstices between consecutive convolutions of the wire. After the wire has been laid on so as to form a nut, and then the screw withdrawn, the nut or wire coil is introduced into a hole which has been drilled or otherwise formed in the wall for this purpose, and which is slightly wider than the diameter of the nut measured over the outer layer of the wire, after which the interstices are filled up with plaster of Paris, cement, or similar binding material in a plastic condition. When the said binding material has become sufficiently hard and firm, the screw bolt which has served as a core, or another screw bolt having the same diameter and pitch, is screwed into the wire coil, and may now be screwed out and in repeatedly without damaging the wall, because the wire serves as a screw nut, which is secured to the stone or wall by the cement or other binding material.—Philadelphia Record.

The "Meteor" Gas Burner.

A new incandescent gas burner called the "Meteor" burner has been placed on the German market at the remarkably low price of 3½ marks (less than $1). This burner has the usual rod to hold the incandescent mantle, but instead of being steadied on the inside at its lower end, the mantle is held by a sleeve which fits on the outside of the mantle and thereby protects it. The new burner is said to give a very satisfactory light.—Wiener Gewerbe-Zeitung.

Science Notes.

The Paris municipality has changed the name of the well known Boulevard de Vaurigard to Boulevard Pasteur.

James Dredge, Esq., editor of Engineering, of London, has been appointed commissioner-general for Great Britain to the national exposition to be held at Brussels.

Kellas concludes from his experiments that exhaled air contains more argon than before inhalation; from this he infers that it is an important element in the animal economy.

An aquarium and marine biological station is to be established at Honolulu for the study of the marine life of the Pacific. It is said that the expense will be $750,000, and that the funds will be furnished by Mr. C. R. Bishop.

Prof. Atkinson has discovered near Cornell University a "plant atoll," so called from its similarity in some respects to a coral atoll. Only two plant atolls had previously been known. This atoll consists of a ring of growing shrubs floating in a pond, inclosing a circle of water, and surrounded by water. The matted roots hold sufficient decayed vegetable matter to nourish the plants, and as more dead plants and leaves are accumulated year by year the ring is in process of becoming anchored to the bottom of the pond, or, in other words, of forming a ring of earth out in the middle of the pond. The origin of these curious botanical freaks can only be guessed at.

In the Atti dei Lincei, Dr. Vittorio Abelli describes a remarkable case which occurred in the course of a scientific expedition on the slopes of Monte Rosa, says Nature. At an altitude of 4,560 meters a member of the party, twenty-two years of age, was suddenly attacked with pulmonitis, and subsequently completely recovered from the disease. This led Dr. Desiderio Kuthy, of Budapest, to carry on a series of experiments on the action of rarefied air on the Diplococcus of pulmonitis, and also on the Pneumococcus of Fraenkel. Two conclusions were drawn from these investigations: first, that rabbits, after being inoculated with this Pneumococcus, die more rapidly when they are surrounded by air at the reduced pressure corresponding to that on Monte Rosa; secondly, that this occurs, although the Pneumococcus is less virulent when it is developed in rarefied air. In the case of the youth Ramella, Dr. Kuthy considers that the infection was mitigated in consequence of the attenuation of the Pneumococcus arising from the rarefaction of the air, but the same circumstance caused the attack to be more violent in spite of the mildness of the infection.

Referring to a report made by the physiological department of Yale University on the influence of alcoholic drinks upon the chemical processes of digestion, Nature (London) says: The investigations were made by means of artificial digestive experiments, in which the digestive fluids were allowed to act upon the various food substances under definite and constant conditions. Absolute alcohol in four cases appeared to actually stimulate digestive action by a fraction of 1 per cent, but the amount of alcohol present did not exceed 1 or 2 per cent. Whenever alcohol was added in quantities over 2 per cent, digestive activity was markedly checked; in one instance 3 per cent of alcohol reduced the digestive activity by 17·6 per cent. Pure rye whisky containing 5 to 51 per cent of alcohol yielded practically the same results; even an addition of 1 per cent of this spirit was found, taking the average of the experiments, to reduce digestive activity by over 6 per cent. In three cases, however, an increase in digestivity of from 3 to 5 per cent was recorded when additions of whisky in the proportion of from 1 to 3 per cent were made. Brandy, rum and gin gave practically the same results. Whisky can be considered to impede the solvent action of the gastric juice only when taken immoderately and in intoxicating quantities.

Dr. J. A. Harker recently read a paper before the London section of the Royal Society on the determination of the freezing point of mercurial thermometers. The method adopted is to cool distilled water in a suitable vessel to a temperature below 0°, to insert the thermometer, and then bring about the freezing of the water by dropping in a crystal of ice. The thermometer then rises, and finally attains a steady temperature, differing only very slightly from the true zero. The apparatus employed consists of two portions, the thermostat and the cooler. The former is a copper vessel, filled with either refined petroleum or a strong solution of common salt. This vessel communicates with the cooler, through which the liquid can be pumped by a rotary stirrer; and by this means it can be cooled and maintained for some time at about −2°. The distilled water to be frozen is contained in a glass tube of about 300 c. c. capacity. This is first placed directly into the circulating liquid, and cooled quickly to −0·5° or −0·7°. It is then transferred to a cylinder lined with polished metal, placed in the center of the thermostat. The thermometer whose zero is to be taken is then quickly fixed in position, the bulb and a considerable length of the stem above the zero being immersed in the water. A crystal of ice is dropped in, and the temperature quickly rises to the freezing point.