

THE SCIENCE NEWS-LETTER

A Weekly Summary of Current Science

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Saturday, April 14, 1923

YEAST YIELDS DIABETES TREATMENT

An extract of yeast that may take the place of insulin, the specific for diabetes, has been obtained by L. B. Winter and W. Smith in the Biochemical Laboratory at Cambridge, recent reports reveal.

Great similarity to the pancreatic extract for treating diabetes which was isolated last year at the University of Toronto has been shown by the newly discovered solid substance from yeast that the Cambridge scientists are now investigating further.

"When a solution of this substance is injected into rabbits, a very definite lowering of the blood sugar occurs, in every way comparable to that which we have found after injections of insulin," their preliminary report says.

Messrs. Winter and Smith, with Dr. Devereus-Forest, recently showed that there is present in the blood of normal persons a sugar that is not present in those suffering from severe diabetes mellitus. From the effects that extracts of pancreas and liver were found to have on this sort of sugar, and because phosphates which occur abundantly in yeast were found to activate the extracts, the scientists were lead to the possibility that yeast would yield an insulin substitute.

The production of an insulin substitute from yeast is considered a great step in advance for it is expected that it will greatly reduce the cost of preparation of an anti-diabetic drug. Insulin today is almost prohibitive in cost, since it is difficult to prepare and must be taken continually. Furthermore, yeast is a source far less likely to furnish along with the desired extract such dangerous toxic substances as have caused trouble in the case of the pancreas extract.

Yeast is today the source of a number of interesting, and possibly valuable substances which are being studied at various laboratories in America and abroad. Dr. Atherton Seidell in Washington at the Hygienic Laboratory and others are preparing from this substance one of the important vitamins and making studies of this life-factor in its effect upon pigeons. At Cambridge a year ago Prof. Hopkins, the great English bio-chemist, isolated from yeast a substance which was named glutathione. This is receiving much attention from the scientific world because it is one of the necessary factors in the respiration of living cells. By means of studies with it our knowledge of the chemical mechanism of cell-life is being greatly increased.

READING REFERENCES- Benedict, F. G., and Joslin, E. A study of metabolism in severe diabetes. Carnegie Institution of Washington, Washington, 1912. Insulin as a cure for diabetes. Science 56:665, December, 8, 1922.

ELECTRON DISCOVERER COMING TO AMERICA

The discoverer of the electron, Sir J. J. Thomson, now head master of Trinity College, Cambridge, England, is now in America. Prof. Thomson, considered by many as the greatest living physicist, will deliver several addresses during his stay in this country.

He addressed the American Chemical Society at its New Havey meeting on April 4, and during the week of April 9 he gave five lectures before the Franklin Institute of Philadelphia on his latest researches on the constitution of matter.

In 1897 Prof. Thomson proved that the rays given off from the cathode or negative electrode within a vacuum tube are streams of very minute bodies of negative electricity. He then called them "corpuscles", but later another term "electrons" has come to be used.

Though that was only 26 years ago, now every boy with a radio set knows electrons by name at least and they have revolutionized the scientific ideas of matter. Any radio fan with a tube receiving set can see for himself cathode ray discharges from the filament to the plate in his electron tube.

It is now believed that all matter, even the ink on this paper, is made up, in the final analysis, of electrons, particles of negative electricity, and protons, particles of positive electricity. All substances are thought to be composed of electricity of these two different sorts.

It is hard to get an idea of the minuteness of an electron. The most powerful microscope known would barely enable us to see an object 200 atoms wide, and if an atom were about the size of a large office building, an electron would be the size of a pin head. About 20,000,000 electrons side by side would form a line of sufficient length that it might be seen with that powerful microscope if the line were also the same number of electrons wide. The diameter of an electron is about thirty trillionths of an inch. The electron has only one eighteen hundredth of the mass of the hydrogen atom which is the lightest one known.

Prof. Thomson received the Nobel prize in 1906 and he also holds many medals from the great scientific bodies of the world.

Since his early work he has developed a great research laboratory of experimental physics at Cambridge and he has continued his researches.

READING REFERENCES- Mills, John. Within the atom. New York. D. Van Nostrand Company, 1922. Millikan, Robert Andrew. The Electron. Chicago, University of Chicago, 1917. Bragg, Sir William Henry. Electrons and ether waves, being the twenty-third Robert Boyle lecture on May 11, 1921. New York, London. H. Milford, Oxford University Press, 1921.

A new type of submarine cable has been developed which it is believed will carry a traffic several times as great as any existing cable.

A new variety of nectarine or smooth-skinned peach, suitable for home garden cultivation, has been developed at a New York experiment station.

In Belgium medicines for external use must be put up in yellow-brown, octagon shape bottles with special red labels. -----

Dr. Edwin E. Slosson

CHATS ON SCIENCE

POWER FROM PRICKLY PEARS

From South Africa comes the encouraging tidings that freedom from the petroleum power may come from the pesky prickly pear. It seems that a farmer in the Orange Free State who had the misfortune to be infested with the cactus scourge conceived the happy idea of converting his curse into a blessing by fermenting the fruit into motor fuel. Finding his formula worked he supplied samples of the fluid to his neighbors who used it in their cars and tractors with such satisfaction that the project passed to the stage of public demonstration and selling stock in the Mother Country.

It is stated that land bearing a good thickly thorny crop of prickly pear will yield twenty tons of the fruit and that every ton of pears can produce thirteen gallons of alcohol. To this is added denaturants and a third of a gallon of an unspecified chemical. Since there are 2,000,000 acres of fertile land infested with prickly pear in South Africa it is easy to figure out that the annual output of motor fuel should be 350,000,000 gallons and since South Africa uses only 12,000,000 gallons there would be an abundance to export. And since gasoline costs \$1.30 a gallon there and the new fuel is to be sold at 45 cents a gallon, it is a short jump to the claim that "there's millions in it."

To be sure, certain difficulties occur to the reader. For instance, who will gather the fruit from the cactus thicket? It is answered that they will be gathered "at a nominal cost" by the negro children who are very fond of them. But if they are like other children their ardor for fruit-picking will diminish as their appetite is satiated. I imagine it will be a long time before we hear the wife of the rancher in our own arid region tell the children to "run out and pick a few bushels of pears so your pa can go to town on Saturday".

But whatever the difficulties the process is possible and it is to be hoped that something of the sort will prove profitable. South Africa has to import her gasoline and is already resorting to a substitute called "Natalite", from Natal where it was first used. It is essentially a mixture of alcohol and ether. The ether is manufactured from alcohol and is added to make the fuel more volatile and easier to start from the cold. Natalite, not too offensively denatured, might prove very popular in America as a mixed drink if secretly circulated among our booze-imbibing fashionables at high enough price.

America was most richly endowed with petroleum on the start but it is a migratory mineral and we lost a lot of it in our haste to get it out and wasted a lot more in our haste to sell it. Some day we shall have to resort to a substitute, such as alcohol, which is grown as it is used. In fact, alcohol motor fuels are already coming into use and would be more common if it were not for the restrictions that have to be imposed at present to prevent their use as a beverage. It is to be hoped some way may soon be found to make the legal limitations less bothersome and expensive and at the same time sufficiently strict to insure that the alcohol gets into the carburetor instead of into the stomach.

If so, we may find a use for all sorts of waste materials, including perhaps the prickly pear, though this is not so serious a plague as it is in other lands to which it has been accidentally or intentionally exported. In Australia it has multiplied like the rabbits and forms impenetrable jungles over millions of acres.

The government there will lease you 5,000 acres for ten years for a rental of one peppercorn a year if you will only clear the land of its cactus.

Cactus of all kind is exclusively an American invention, most ingeniously adapted to resisting drought and warding off eaters. It is not found anywhere else on earth except as it has been carried from this country. If you see it in the desert scenes of a biblical movie you will know that the picture was filmed in Hollywood instead of in the Holy Land, unless perhaps the plant has invaded Palestine in recent years.

The world feels a grudge against America on account of the cactus. It is a thorn in the flesh of foreign nations. If now they could make motor fuel from it and so get even with the oil trust, which they also blame us for, they might feel better toward us.

CHLORINE GAS WARDS OFF "FLU" IS CLAIM

Chlorine gas, the gas used in the Great War as a weapon of offense, has been turned with effect against the germs of influenza. Prof. Harrison Hale of the University of Arkansas reported the results of experiments made with students at that University to the American Chemical Society meeting at New Haven. The gas is not a cure but a preventive of the disease, he stated.

Tests were made during the recent epidemic on 300 faculty members, students, and other volunteers who breathed air containing a very small quantity of chlorine for five minutes a day. When the tests were made the number of cases of influenza in the University dormitories was at the rate of 133 per 1,000.

Among all those taking the treatment the rate was 44 per 1,000. Some of these were already ill when taking the gas, others took only one or two treatments and developed the disease later. Omitting these cases and confining the results to those who took the gas before becoming ill and who continued the treatment over a period of days, the sick rate from influenza was 13 per 1,000 or one-tenth of the rate among those who were not "gassed". Results are said to confirm former tests made during the epidemic three years ago.

The gas was breathed in very dilute concentration as when at all concentrated it is corrosive and poisonous.

LEAD AND ALCOHOL KNOCK THE KNOCK FROM POOR GAS

Lead is one of the heavyweights and alcohol one of the bantam weights of the chemical world, yet Thomas Midgeley, chemist of the General Motors, has made them join hands amicably to vanquish the "knock" in automobile engines. A new compound similar in effect to one reported last year was described by Mr. Midgeley at the meeting of the American Chemical Society at New Haven.

The substance is an oil composed of six parts of ethyl, which is a group of carbon and hydrogen atoms always found in alcohol, combined with two parts of lead. By adding it to gasoline a lower grade of that fuel may be used without the engine knocking about it. Only a few drops are needed.

The new anti-knock is called by the chemists "di-plumbic hexa-ethide" but

doubtless a pet name will be given to it before it is put on the market. It is made by mixing a compound of alcohol and iodine with an alloy of lead and sodium. The resulting substance is treated successively with hydrochloric acid and caustic soda and then electrolyzed.

MENTAL EXPERTS TO POOL SERVICES
IN PSYCHO-EDUCATIONAL INSTITUTE

Establishment of a psycho-educational institute to provide a central agency where professional services by reliable psychologists, educators, physicians and psychiatrists may be combined on problems relating to the mental development of children, was proposed by Dr. L. L. Thurstone, of the Institute for Government Research, at a recent meeting of the Washington Branch of the Psychological Corporation.

Just as parents now take their children to the dentist for examination of their teeth, he pointed out, they might take them to this institution where recommendations as to their mental development will be made from a series of more intensive individual intelligence and educational tests and physical examinations than can be given by the public schools, together with the combined findings of specialists in the different fields.

"If it is proposed to induce a child to cover two grades in one year, or three grades in two years, there are several facts to be considered in making the recommendation," Dr. Thurstone said, "first, the child's mental development compared with its age should be determined by means of the Binet and other intelligence tests. If the child is found to be bright for its age, it will be necessary to consider its physical condition. The physical examination will be made with this particular problem in mind, either by the family physician or by one of the consultant physicians of the Institute. If the child's health warrants the additional task, it might still be questionable if the child would be associating with children who are very much older. Consequently, the emotional and social development should be taken into consideration in making such recommendations. This Institute will make it possible to get the advice of the different specialists combined in one central agency which, after considering all the factors that entered into the situation, would make the best possible recommendations to the parent."

The Institute would also be prepared to give advice regarding the various forms of speech defects so as to combine the recommendations of physicians with the experience of educators and psychologists.

"Such an organization could also give vocational advice," he explained. "Psychologists at work in the college laboratories have developed several lines of technique for vocational advice which the institute can utilize for practical work. It should be the purpose of this Institute to make generally available, in the form of professional service, the results of these scientific studies in the psychological laboratories of the college. One field in which reliable service can now be given is that of musical talent. The methods are available for measuring this talent with considerable reliability."

The plan as outlined by Dr. Thurstone further called for careful records to be kept of each child examined, so that the success of the recommendations may be determined from time to time. He proposed that the Institute be organized not for profit, but that fees be charged so that it will be self-supporting, while all surplus funds should be devoted to scientific study.

A committee was selected to work out more detailed plans of organization.

SHOTGUN PILLS OUT-OF-DATE SAYS DOCTOR

The old-fashioned pellet of our fathers' and grandfathers' day is out-of-date, Dr. Arthur D. Hirschfelder of the University of Minnesota, said in addressing a general meeting of the American Chemical Society at New Haven. The 1923 model pill prescribed by the up-to-date physician is a much more effective weapon against disease.

The difference is that in the older days the doctors used to give a drug containing a number of active constituents so that one of them might act specifically to relieve the symptoms from which the patient was suffering. Some of these extra constituents were not only ineffective against the disease in question but were irritating and even harmful. The modern chemist has dissected these drugs, selected the active principle and made it up into pills which hit the target with an accuracy which might be compared to the relative efficiency of a rifle bullet as against a charge of shot.

Chemists have even gone further, Dr. Hirschfelder said, and have by a study of the active principles of drugs, built up others artificially which are even simpler and more efficient in their action. For they have shown that it is not the whole chemical substance which is usually effective, but a part of it, a group of atoms which in chemical parlance is called a radicle. So they dissect out the remedial radicles and put them together into new combinations, which before being used on man are tried on animals.

By this method Ehrlich produced salvarsan, the specific for syphilis, starting with a drug known as atoxyl which was just as efficient but which caused blindness. The parts which were deleterious were dissected away, the residue put together in new ways and the valuable specific resulted. Similarly, new substitutes for cocaine have been recently built up that are less toxic than the natural drug. A remedy for the African sleeping sickness has been invented by the Rockefeller Institute in New York, and a still better one, "Bayer, 205", is reported from Germany.

Derivatives of quinine are now being investigated, Dr. Hirschfelder said, in the hope of getting a specific against pneumonia. One had been prepared which was effective in mice, but poisonous to men, he said.

NATURAL GAS WAS GOD OF FIRE WORSHIPPERS

The eternal fire of the ancient fire worshippers, which burned at Baku on the Caspian Sea, was nothing but the burning gases from petroleum, said Carl O. Johns, research chemist of the Standard Oil Company of New Jersey, at the general meeting of the American Chemical Society at New Haven.

"The Tower of Babel and the walls of Babylon were built with petroleum pitch as mortar", he declared. "Ancient records of China and Japan refer to petroleum as a common fuel in some parts of those countries, yet although it was known there and in other parts of the world since prehistoric times, and had long been used as a medicine, it was not generally used as an illuminant until the 19th century."

But the knowledge of the chemistry of petroleum has not kept up with technical use of it, the speaker said, telling of the growth of the industry in America from the Drake well of 1859, which gave 25 barrels of oil a day to the country-wide production of more than 551 million barrels last year. When kerosene was first introduced the popular illuminant was whale oil which sold at \$2.50 a gallon, he stated.

"The petroleum industry needs fundamental scientific research of the chemical composition of crude oils, a work worthy of the efforts of our best trained chemist Mr. Johns declared.

INFLUENZA CAUSED HIGH FEBRUARY DEATH RATE

The death rate for February was the highest recorded for that month since 1920, at which time the first recrudescence of the great 1918 influenza pandemic was its height, according to Dr. Louis I. Dublin, statistician of the Metropolitan Life Insurance Company. The mortality increased 9.8 per cent. over the January figure and was 7.7 per cent. higher than it was in February, 1922.

"We need not go beyond the presence of epidemic influenza in seeking the explanation for the high February death rate," the statement to Science Service said. "Of the 11,999 Industrial policyholders of that company who died during that month influenza was the cause of death in 2698 cases, or nearly one-quarter of the total. But even this high mortality is by no means a full measure of the effect of influenza on the death rate. Experience in prior epidemics has demonstrated conclusively that influenza is an important factor in hastening the deaths of many persons who have chronic ailments. This doubtless had much to do with the eight per cent. increase in February in the mortality from organic heart disease and with the four per cent. increases for chronic Bright's disease and pulmonary tuberculosis."

The influenza situation this year has been more serious than the outbreak that occurred early in 1922, Dr. Dublin said. It has been of longer duration and has been responsible for a higher death rate. The disease, it is true, has not prevailed, by and large, in the extremely virulent form that was in evidence in 1918. But despite this fact, it has been responsible directly or indirectly for the deaths of many thousands of persons in the United States and Canada. Even though it did not, as a usual thing, run quickly into pneumonia and cause death as did the 1918 type of the disease, it took this course frequently enough to be either the direct or underlying cause of a large increase in the death rate.

Dr. Dublin concludes that when epidemic influenza prevails, no matter how mild the type, a public health problem of the first magnitude confronts the country.

ARTIFICIAL SILK NOT TO THROW SILK WORMS OUT OF JOBS

Although 23,000,000 pounds of artificial silk were produced last year, or three per cent. more than the natural product of the silkworm, the artificial fiber is not a substitute for the natural, according to Dr. W. O. Mitscherling who described the manufacture of the product to members of the American Chemical Society at its recent meeting at New Haven. The product of the chemical factory must be placed in a class of its own, he said.

Artificial silk, or "cellulose silk" as the chemists prefer to call it, is made from cellulose or woody fiber, which may be derived from cotton, wood, or similar substances. The principle of its manufacture as described by Dr. Mitscherling consists essentially of dissolving the cellulose in chemicals and then forcing the solution through small holes into another liquid in which the cellulose is insoluble, thus causing its separation in thin fibers which are subsequently washed clean of all chemicals and woven.

"The new fiber gains more importance very day," he said. "It produces not

only the most beautiful textures, but it lends itself to limitless possibilities. Regardless of by what specific process the cellulose silk is produced, it has a great future for each variety has a splendid market of its own."

READING REFERENCES- Slosson, E. E. Creative Chemistry. New York, Century Company, 1920. Foltzer, Joseph. Artificial silk and its manufacture. London, New York, Sir I. Pitman and Sons, 1921.

BAKING NOT A HOME INDUSTRY SAYS CHEMIST

Baking is no longer a task for the housewife or the journeyman baker, but a process which can be well done only on a large scale under scientific supervision, Dr. H. E. Barnard, director of the American Institute of Baking, told members of the American Chemical Society at its recent meeting. Baking science has developed more in the past 10 years than in all the previous years of man, he said.

This, he stated, was a result of the World War which amalgamated 33,000 individual bakers into a great industry under controlled shop methods. A vision of the value of science and a realization of the need of the skilled advice of the chemist has arisen.

"The baking of bread today is a chemical process," he said. "It is carried on in huge laboratories filled with automatic machinery and operating under temperature, humidity, and time control. The quality of the bread depends upon the control of the processes of fermentation."

Dr. Richardson told of the result of chemical research in shortening the time of fermentation by four hours. Fermentation was formerly needed to ripen the gluten upon which, in large part, depends the quality of the bread. Chemists found the result of this fermentation to be the production of lactic acid which was the active principle in the ripening process. Instead of training a million yeast plants to develop the proper acidity, the dough is now analyzed and the requisite amount of lactic acid added in the mixer.

"With materials, methods, fermentation control, and the subsequent processes of proofing, baking, cooling, and wrapping, all in the hands of the chemist technically trained in bake-shop operations, the making of bread is no longer a duty for the housewife or the craft of the laborer," the speaker said. "It is the application of chemical and biological skill to the production of the Nation's food."

SUBSTANCES MADE BY LIGHT MAY BE CLUE TO LIFE'S ORIGIN

The production of typical organic compounds, such as are found in green leaves, through the action of ultra-violet light upon air, water, and carbon dioxide, was announced by Dr. Oskar Baudisch to the American Chemical Society at its recent meeting, as a process which is believed to give a clue to the origin of life on the earth.

The first step was the formation of an unstable substance called formaloxime which in the presence of sunlight unites with formaldehyde to form more complicated organic products. Formaldehyde may be made directly from carbon dioxide and water by the action of light. Formaloxime has the property of uniting with iron and some

other metals to form substances in which the metallic character of the iron is masked by the organic character of the compound.

Dr. Baudisch suggested that since iron and magnesium were foremost in the processes of the chemistry of living things, iron being present in the red corpuscles of the blood of all the higher animals, while magnesium is present in chlorophyll, the green coloring matter of leaves, this power of ultra-violet light to build up organic compounds which will unite with these metals may give a hint as to how life first came to exist.

The iron of the blood carries the oxygen to the tissues, a process which modern medical science has shown to be greatly influenced by light, while Dr. Baudisch stated that the magnesium in leaves possessed a similar power to activate hydrogen in the presence of light. It is his theory that life may have been caused through the direct action of sunlight upon water, air, and carbon dioxide in the ancient geologic past when, he believes, sunlight was more intense and contained more ultra-violet light and the air contained more water vapor and carbon dioxide than at the present time.

FAILURE OF RADIO RELAY CHARGED TO NORTHERN LIGHTS

Did Aurora Borealis break up the attempt to relay messages across Canada by radio? The American Radio Relay League headquarters received information at Hartford, Conn. from a Canadian amateur in which he notes difficulty in receiving 360 and 200 meter messages and also mentions seeing the colored streamers and filaments of the Northern Lights. This is taken as additional evidence that there is some connection between radio and this great atmospheric phenomenon.

When questioned about the alleged connection between radio and Northern Lights and its responsibility for the failure of wireless messages in Canada recently, Dr. S. J. Mauchly, of the Department of Terrestrial Magnetism of the Carnegie Institution, said that there were many other things which might have prevented the messages from getting through, but that it is entirely reasonable to suppose that there is some connection between the two, as both radio and the Aurora are electrical phenomena. The relation of the two, he said, needs investigation.

EINSTEIN MAY HAVE SOLVED MAGNETIC MYSTERY

If Einstein in his latest work has connected gravitational force and the electro-magnetic field of the earth by a mathematical relationship, he has accomplished a very difficult thing in the opinion of American scientists.

Dr. Louis A. Bauer, director of the department of terrestrial magnetism of the Carnegie Institution of Washington, considered the cabled announcements of Einstein's new achievement too meager for comment but he revealed to a Science Service representative recently that he and Einstein discussed such problems when Einstein lectured at Princeton in 1921.

For many years Dr. Bauer and his staff of experts have made the magnetism of the earth and the electricity of the atmosphere their special study. As a result they find that the earth's magnetic and electric fields change markedly at relative-

ly short intervals in a more or less systematic manner. In an adequate discussion of the cause of the Earth's magnetism, Dr. Bauer states, it is necessary to take into account both the marked geographical variations in the intensity of the magnetic field, as well as the comparatively large changes from year to year. Thus, Dr. Bauer finds that at the equator of the Earth the intensity of magnetization is about 17 per cent. greater than at parallels 60 degrees North or South. He further states that the Earth's magnetic moment, or its intensity of magnetization, has been diminishing during the past forty years at an average rate per annum of about one-thousandth part, or one-tenth of a per cent., but it cannot be stated at present how long this diminution may continue or whether at some future time an increase may not take place.

As the result of its accumulated data, and its theoretical and experimental investigations, the Department of Terrestrial Magnetism has at present the most complete information for testing any theory concerning the cause of the Earth's magnetism.

Gravitation, the force that holds everything to Earth and gives everything its weight, varies only by exceedingly small amounts at different parts of the Earth and no such large regular variations with time have been found as in the case of magnetism. The Einstein mathematical relation must take into account these differences between magnetism and gravitation. Dr. Bauer states, however, that the relation may be of such a character so that if, for example, the Earth's intensity of magnetization diminishes at the average rate of one-thousandth part per annum, as above stated, the Earth's gravitational force may change annually only by the square of one thousandth part, or one-millionth part - a quantity too small to be readily detected with the appliances at present in use for measuring gravity.

The statement of Einstein that he owes the basis of his new theory to Professor A. S. Eddington, director of the University of Cambridge Observatory, England, is especially interesting for it was Eddington who first made Einstein known to the English-speaking world by his "Report on the Relativity Theory of Gravitation" in 1918. After the memorable eclipse of May 29, 1919, it will be recalled that the Astronomer Royal of England, Sir Frank Dyson, and Professor Eddington, announced the confirmation of the predicted amount of deflection of the rays of light passing through the Sun's gravitational field, as called for by the Einstein relativity theory. The scientific world is now awaiting with eagerness to learn if the results of the British astronomers are substantiated by the eclipse expedition that was sent from the Lick Observatory, under the charge of Director, Professor W. W. Campbell, to Australia last September.

 READING REFERENCES - Eddington, A. S. Space, time, and gravitation, an outline of the general relativity theory. Cambridge, The University Press, 1920. Einstein, Albert. Relativity. New York, Henry Holt and Company, 1920.

Molba XV, a New South Wales cow, is the world's champion butter producer, having yielded 1,316 pounds of butter fat in 365 days.

 Japanese fishermen dye sea slugs with various chemicals if these snails lack the color considered to be most choice by the Chinese and Japs who eat them.

 There are 250,000 patients in hospitals for mental disease in this country.

 Over ninety per cent of a blanket of new snow is made up of air.

 Russia is reported to have contracted for a number of Diesel-engined locomotives, which may be operated without water; a distinct improvement over steam engines in a country where water is scarce.
