Correspondence.

Immunity From Consumption.

To the Editor of the Scientific American:

Pulmonary tuberculosis, or consumption, is the most common and dangerous of all diseases, in fact, the public statistics show that more than one-tenth of all deaths in the United States result from this disease, while between the ages of fifteen and forty-five the proportion is increased to thirty-three per cent, which means that one death in every three between these ages results from tuberculosis. Dr. Alfred Hillier, secretary of the British National Association for the Prevention of Consumption, has for many years made a close study of this malady. In his new book, he states that "deaths from tuberculosis in England and Wales are estimated to amount yearly to 60,000, and in the rest of Europe to a million. In England one-half the deaths between the ages of twenty-five and thirty-five are caused by this disease."

It is a well-known fact that tuberculosis is due to the tubercle bacillus, a vegetable micro-organism which is motionless and helpless, but under the proper conditions can grow and reproduce itself very rapidly. It has been estimated that in some cases, two or three thousand millions of tubercle bacilli are discharged in the expectoration from a single case of consumption in the course of twenty-four hours. If such sputum lodges in places where it afterward dries and becomes pulverized, as on the street, floors, carpets, clothing, or handkerchiefs, these germs are liable to float in the air as an invisible dust, making it an easy matter for one to inhale them into his lungs. Everyone does inhale them more or less often, but if the lungs are fully developed and in a healthy condition, the germs will not prove harmful.

The tubercle bacillus requires an unhealthy tissue and a certain amount of moisture to favor its development, and the lungs are most frequently infected because they are seldom fully developed in the human being, and especially in women. This is due to the fact that the apex or top of the lung is seldom filled with air, and consequently the tissue in that part of the lung becomes weak and unhealthy, for want of use, and makes the best kind of a place for the rapid development of this dangerous germ.

For many years the medical profession of the entire world have devoted their thoughts and energies to the discovery of some cure for tuberculosis; but all efforts to cure the disease by drugs have utterly failed, and they now admit that the only thing that can be done is to give the patient plenty of fresh air, and adopt such strict sanitary measures as will prevent the spread of the disease to others. As pulmonary tuberculosis—consumption—is the most common form of this disease, and is due to imperfect development or unhealthy condition of the lungs, *why not make all children, and others, immune from the disease, by teaching them how to breathe properly, thus developing every part of their lungs, and making it impossible for the tubercle bacillus to live there?*

When the disease is once established, it is difficult to cure it, because the patient's vital force is so low that he does not have sufficient power of resistance to repel the disease. Small or unused lung capacity means low vital energy; but when the capacity is increased, the vital force also is increased, as well as the power of endurance, giving the person greater power to resist diseases of any kind.

The common nervous breakdown among children, as a result of overwork or too much mental strain, would seldom occur if the lungs were used as nature intended them. The matter of developing the lungs is very simple, and can be accomplished without any extra expense to the city or community. If all physicians would instruct their patients how to breathe properly, and if the boards of health and boards of education would compel all the schools to have their scholars rise in their seats and practise breathing exercises for a few minutes every morning, at the opening of the school, and at the same time tell them to practise these exercises on rising in the morning and at other times during the day, the result would be that their lungs would soon be in a healthy condition, and they would probably breathe properly during the balance of their lives.

If this rule was strictly carried out, the new cases of tuberculosis would soon be greatly reduced and, in a comparatively short time, tuberculosis would be substantially eradicated from our community. In the incipient stage of the disease, these breathing exercises will assist greatly in effecting a cure.

No elaborate breathing exercises or gymnastic movements are necessary to properly develop the lungs, in fact, one simple breathing exercise would be sufficient —the double-breath. This exercise is taken as follows: Stand erect, with the hands at the side, in line with the legs; take one long, full breath, hold it for a second, then take another quick, short breath on top of the other breath, and hold all for a second longer, then gradually exhale the air through the nose. All inhalations and exhalations should be through the nose, and not by the mouth.

There are a number of breathing exercises which will develop the lungs, but I mention this one as the best of all. Persons who are suffering from this disease, in an advanced stage, should practise the long, deep single breath for some time—several days or weeks—before attempting the double-breath, as the latter is only intended to develop the lungs of those who are not seriously ill. If you will try this double-breath exercise, even once, the extreme top of your lungs will no doubt experience, for the first time, the agreeable sensation of a "breath of fresh air." It is impossible for any one to contract consumption who will completely fill the air cells in his lungs with fresh air several times a day. C. L. Topliff.

New York city, March 10, 1904.

THAWING OUT FROZEN WATER PIPES BY ELECTRICITY FROM STORAGE BATTERIES.

In a recent issue of this journal we described a method of thawing out frozen water pipes by means of alternating current transformed down to a voltage of 50. While the apparatus described makes it possible to do this expeditiously where alternating current is available, there are nevertheless many instances where such current cannot be obtained. In such cases it is quite feasible to employ storage batteries as a source of current, as these can easily be carted to the place where the current is needed and be made to supply sufficient for quickly thawing out any ordinary water pipe.

Mr. T. D. Bunce, president of the Storage Battery Supply Company, of this city, recently made use of forty-eight 200-ampere-hour cells of battery for thawing out a ½-inch service pipe and a section of a 2-inch main in Borough Park, Brooklyn. The diagram shows the connections that were made for thawing out the former, while the main between the two service pipes was afterward thawed out by attaching the wire seen running to the house to it at *I*.

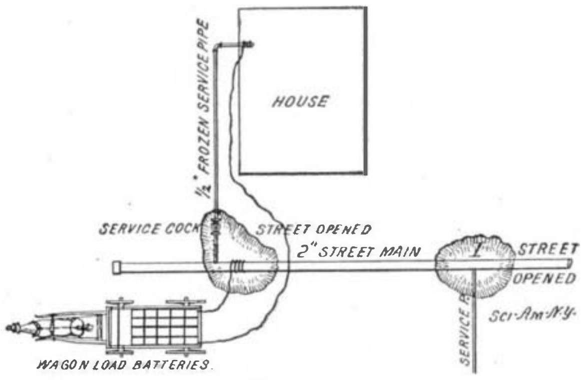

DIAGRAM OF CONNECTIONS FOR THAWING WATER PIPES WITH STORAGE BATTERIES.

Before attempting to use storage batteries for this purpose, Mr. Bunce first carried on some experiments to determine the amount of current and the voltage required to thoroughly heat an iron pipe. He connected two 10-foot lengths of ¾-inch iron pipe with a ¾-inch tee, plugged the outer ends of the pipe, filled it with water, and inserted a thermometer in the tee. This showed the water to be at a temperature of 39 deg. F. Connections were made to the ends of the pipe from two storage battery cells (4 volts) by means of heavy copper cables, and the ammeter registered 185 amperes, while the voltage at the ends of the pipe was 2½. The drop in voltage was due partly to the resistance of the wires and pipe, and partly to a lowering of the voltage of the cells under the heavy discharge. Kept up for 10 minutes, this flow of current raised the temperature of the water only 2 deg., and the pipe was not so hot but that a person could hold his hand on it without burning. Three cells were next connected in series, giving an additional voltage on open circuit of 2 volts; and the result of this addition was to send 260 amperes through the pipe. Flowing for 10 minutes, this current raised the temperature of the water 18 deg., or to 59 deg. F., and the pipe was uncomfortably hot to the touch.

With this data as to the voltage and current required to quickly heat an iron pipe, Mr. Bunce had his battery carted to the house where the water pipe was frozen. The joint of the service pipe and main was uncovered, and a connection was made from the battery to the main by means of a heavy wire cable and a special strap and clamp. The other terminal of the battery was connected to the ½-inch service pipe where it came through the cellar wall. The cells were arranged in series and multiple, so as to give a voltage of 16. The current was over 300 amperes at the start, and gradually fell to this figure. It was kept on for 20 minutes, so as to make sure of thawing out the large brass service cock as well as the pipe. The temperature of the latter rose rapidly, until, at the end of 20 minutes, the pipe was too hot to hold in one's hand. As no water flowed, the conclusion was reached that the main was frozen. The house was the last one on the street, and the main ended just beyond it. At the next house the water was running, showing that the main was frozen only between the two houses. Consequently the wire which had been run to the house was clamped to the main at *I*, the cells were arranged in 16 sets of 3 each, connected in multiple, thus giving 6 volts and each cell furnishing one-sixteenth of the total current. This was probably in the neighborhood of 2,000 amperes. It was kept on for 5 minutes before the water began to flow.

These experiments demonstrate that the amount of electric energy needed to thaw out water pipes is much smaller than was stated in the previous article on this subject, which we published two weeks ago. The experimenter there stated that 11 to 15 kilowatts were necessary to thaw out a ¾-inch 30 or 40-foot pipe in from 5 to 8 minutes. Mr. Bunce used only about 4½ kilowatts to thaw out 70 feet of ½-inch pipe, and probably about 10 or 12 kilowatts to thaw out 20 feet of 2-inch main. The fact that with storage batteries there is no loss of energy in a rheostat or transformer doubtless accounts for this considerable difference. The batteries have a decided advantage in this respect, as the proper voltage for thawing a certain length of pipe can be obtained, thus making auxiliary resistance unnecessary.

Electrical Notes.

A remarkable instance of the durability of electric pumps is reported from South Africa, where, in the mining districts, electricity and compressed air are fighting for supremacy. It was after the cessation of hostilities that the two shafts of the Knights Deep mine were found to be flooded out. The plant and other apparatus had been left just as they were before the war broke out, and the electric pumps and cables which were used at the mine had been under water for quite two and one-half years. Notwithstanding, the motors were brought out, dried, and set to work again. The firm who supplied the motors is not mentioned, but their name deserves to be placed on record.

The new White Star liner "Baltic" is probably better equipped electrically than any other boat either afloat or building. In addition to the usual electrical appliances to be found on board present-day ocean liners, the "Baltic" is equipped with an electrical device for preventing collisions with other vessels. The moment another ship enters the "magnetic field" of the "Baltic" the needle of the indicating instrument points in the direction of the vessel approaching or being overtaken, and the steersman knows at once what course to take. Even the rhythmic beats of an unseen steamer's screws are registered by means of this delicate apparatus. Another safeguard is an electrical contrivance to show if the ship's lights are burning properly. An electric log for ascertaining the speed of the ship is another acquisition, and an electric lead for ascertaining the depth of the water is also on the list. There is, further, an electric device for registering all signals, including steam sirens. The "Baltic" is equipped with electric refrigerating as well as electric cooking apparatus.

Series motors approach to some degree the elasticity of steam engines, but for their dissipating in starting part of their energy on passive resistance. As these motors should therefore be fed at variable voltage, monophase motors seem to be especially available for electric traction purposes, allowing of high-tension currents being used, and necessitating only one feeding wire, in addition to the rails serving as the return circuit. The series monophase motor designed by Dr. Finzi (Elettricista, November, 1903), when working at constant voltage, automatically regulates its speed according to the load, the speed being inversely proportional to the latter for high values of the torque required. It permits of the regulation of the voltage when starting being effected without losses, and of the speed being varied within very extensive limits. On the other hand, it is not able to use directly high voltages, and is at present only applicable to relatively low frequencies. The characteristic curves of the motor, as given in the original paper, have several advantages. Thus, comparing the monophase and continuous-current motors designed for speeds of 22 kilometers per hour, the former will require in starting 9.4 watt-hours per ton, whereas the figures necessitated by the direct current motor are as high as 12.35 watt-hours. As regards the energy absorbed during a trial run by the two motors under equal conditions, for mean speeds of 17.5 kilometers per hour and about 2¼ starts and stops per kilometer, the integrations of the diagrams give for the monophase car, weighing 9.45 tons, 45 watt-hours per ton-kilometer, and for the continuous-current car, weighing 9.65 tons, 70 watt-hours per ton-kilometer. Calculating the power factor from the experimental curves obtained, the value 0.7 was obtained in starting; whereas at the generating station the power factor, including the line, transformer, and motor, averaged during the run 0.8, varying between 0.6 and 0.95.