Engineering Review

Health and Electricity

The possibility of eradicating the "sand in the human bearings," known to the medical profession as bursitis, by treatment with high frequency currents, as presented by the modern high power short wave radio, has been made known by Dr. Willis R. Whitney, vice president in charge of research of the General Electric Company. Dr. Whitney, who first developed the high frequency induction method of producing "artificial fever" for the treatment of paresis and other diseases some years ago while he was director of the General Electric research laboratory, has been carrying on related experiments in the field of temperature elevation by electric currents for therapeutic purposes.

"Every one is familiar with an X-ray photograph which pictures the contents of a closed purse," Dr. Whitney declared. "In our bodies there are many closed purses, named 'bursae'. Some of these, under abnormal health conditions, disclose to X-ray certain calcareous deposits. Perhaps the largest and best known bursa lies just over the sharp angle of the shoulder between the muscles, and this is the most susceptible to lime deposits. It is not known just what makes the deposit form there, but it is usually attributed to unusual shoulder or arm exercise, or to some local injury or infection. A painful 'stiff' shoulder is the result, and the arm may become almost completly useless. This particular trouble is called 'subdeltoid bursitis'. Until a few years ago it was the best practice to remove the deposit surgically, togethr with the bursa. It now looks as though operation for bursitis might seldom or never be necessary."

The effects of raised temperature on the living body fall into three groups, Dr. Whitney said. The first of these is the possible destruction of foreign or parasitic life by subjection to temperatures which do not harm the body or its organs. A second possible action is the influence of heat on catalysis in general. In both of these divisions the difficulties of experimentation are considerable. The third division, lying in the effects of temperature upon solubilities, he had selected for his work because it offered in the most direct way the advantage of learning, at least in part; what was being accomplished by the experiment. He sought a malady where visible evidences of the dissolving action of elevated temperature might be measured, and this seemed simplest in bursitis.

Experts have indicated that shoulder bursitis can often be traced to some harmful local exertion, varying from too much tennis to carrying a hod. The bursae are generally small, flat, closed sacs lying between tendons and muscles. They normally contain a little thin liquid and seem to facilitate the motion of muscles by interposing their own smooth surfaces, as though for lubrication. The lime deposit, forming beaneath the sac rather than in it, may be hard and gritty or crystalline, and is equivalent to sand in the bearnings of a delicate mechanism.

"It is probable that the effect of heat on this deposit has been known for years," Dr. Whitney continued. "The electrical engineer thinks naturally of supplying the heat by the convenient current. After the development of power radio tubes, it became possible to apply electrical energy internally to the body at a frequency and in an amount which would raise the blood and tissues of the entire human system well above the so-called fever range."

The process used by Dr. Whitney depends on producing internal heating by induction, using high-frequency currents without electrodes. The apparatus changes the current of the common lighting circuit into suitable high-frequency energy. It is based on the use of two Thyratron tubes arranged to ocscillate at about 12 million cycles per second and yield at most about 160 watts. The quantity of energy used is controlled in 16 steps. To the generator is connected a 12-foot coil of flexible copper conductor covered with heavy rubber insulation. The cable form enables it to be coiled about the body or a limb and also to be used as a flexible pad for irregular surfaces. In treating the bursitis cases the coil was placed flat upon the shoulder outside of the clothing. The arrangement induced high-frequency current in the vicinity of the shoulders so that a thermometer under the arm registered 105 degrees Fahrenheit. The coil itself remains cool except where it absorbs heat from the body.

One case of acute bursitis treated by Dr. Whitney was that of a laboratory man who had indulged in much more than usual physical exercise, including tennis, sawing wood, and swimming in cold water. A severe lameness developed in one shoulder and after six days it was necessary that the arm be carried in a sling. A physician recommended diathermy treatment, and after a half hour of this the pain subsided considerably. After three treatments of an hour each, 90 per cent of the soreness had disappeared, but other treatments were administered during the month. X-ray pictures taken before, during, and after the treatment showed the calcareous deposit spreading out and disappearing.

Dr. Whitney also treated a case of chronic bursitis for a trained nurse who had suffered for more than ten years, and whose X-ray photograph showed a dense calcareous deposit. At he end of a month of treatment the patient was using her arm in driving her car, and after another month only a trace of the deposit was visible.

"This process might properly lead to more speculative

or hypothetical studies," Dr. Whitney declared. "It is really quite improbable that the deposition of lime in the overworked tissues of a shoulder in an exceptional process or a narrow and exclusively limited example of some sort of adaptation. There are many other substances than a visible lime deposit which may dissolve and reprecipitate, and many other places than in the shoulder where harmful work may be done. Studies of bursa deposits might suggest experiments on any so-called 'stone' and even on arthritis, sclerosis or ossification."

Streamline Train Economies

An increase of from 150 to 200 per cent in number of passengers carried, a reduction of almost half in operating expenses, and a cost for fuel and lubrication only slightly more than one-fourth the previous cost are among the advantages which have accrued to the Chicago, Burlington and Quincy Railroad with the placing in operating servic of the Burlington Zephyr, America's first streamlined Diesel-electric train. According to figures received by the General Electric Company, which supplied the electric equipment, savings in operating expenses have averaged approximately $4450 per month, or $53,400 per year.

Patronage on the Lincoln-Omaha-Kansas City run has increased beyond the capacity of the train, so that a fourth section is being added to the original three-section articulated train, to increase accommodations from 72 to 112 passengers. So successful has been the new type of train, producing net earnings sufficient to pay for itself in two years, the Burlington is obtaining two more such trains, also electrically equipped by General Electric, for traveling the 431 miles between Chicago and St. Paul and Minneapolis in 390 minutes.

The Zephyr has been operated at a cost of $5152 per month, or 34.21 cents per train mile; the replaced steam trains cost $9601 per month, or 63.75 cents per train mile. Fuel and lubricating oil for the Zephyr cost $585 per month, or 3.88 cents per mile, and for the steam train $2073 per month, or 13.77 cents per mile. Combined maintenance-of-power expenses have been $902 per month, or 5.99 cents per mile for the Diesel-electric, and $2291 per month or 15.21 cents per mile for the steam trains.

The Burlington system, experiencing an increase of 26 per cent in passengers carried on the whole, has reported an increase of from 150 to 200 per cent in the case of the Zephyr. The train leaves Lincoln, Nebraska, at 7:30 o'clock each morning and, 55 minutes later, arrives in the Omaha station, 55 miles away; the steam train required 75 minutes. The Omaha-Kansas City run of 195 miles is now done in 240 minutes, including a station stop at St. Joseph, Mo.; the steam train required 320 minutes. On the afternoon return trip the same speeds are maintained by the Zephyr.

The Burlington Zephyr is at present a three-section unit of light-weight stainless-steel construction. Built at the Budd Manufacturing plant, it is equipped with a 600-horsepower Winton Diesel engine and on the front truck has two series motors which are geared for a maximum train speed of 110 miles per hour. The train is articulated, having three car bodies carried on four trucks, and has an overall length of 196 feet. The first section has three compartments: the operator's compartment, the engine compartment, and a combination railway postoffice and mail-storage compartment. The second section has three compartments: baggage and express, buffet grill, and coach accommodations for 20 passengers. The third section has a 40-passenger compartment with a 12-passenger solarium lounge with chairs.

It was this train that last June made a non-stop record from Denver to Chicago, 1017 miles in 785 minutes.

New Antenna System

A uniqu enew type of antenna system particularly suitable for use with all-wave receivers, the principle of which is based on discoveries made by General Electric engineers in designing the aerials for short-wave stations W2XAD and W2XAF in Schenectady, was recently introduced.

Known as the "V-doublet" antenna system, it not only provides more unform sensitivity in the sort-wave bands, because of its "V" construction, than do conventional antenna systems of the doublet (double-leg) type but it also has characteristics which effect an automatic changeover from short waves to standard broadcasts and other longer wavelengths without sacrificing performance and without requiring the use of a switch. In addition, it minimizes man-made interference of local origin—such as that radiated by house wiring systems or the ignition systems of passing automobiles—which often causes severe disturbance in the reception of short-wave signals.

The design of the "V-doublet" antenna lends itself to various methods of suspension and is simple to install. Only two points of support are required.

The "V-doublet" system, as the name implies, consists of a doublet-type antenna, the center portion of which is shaped like a "V". Signals intercepted by the doublet are fed from the "V" portion through a lead-in composed of a balanced pair of twisted wires, known as the transmission line, to a specially constructed receiver-matching transformer located at the set.

The unique "V" has two effects. First, it contributes to the uniform sensitivity of the new system by reducing the development of what are known as "standing waves." It is the presence of these waves along the length of a conventional single-wire or doublet antenna which is responsible for their non-uniform sensitivity—that is, points of high and low "pickup" effectiveness at different frequencies. Secondly, the "V" portion assists in efficiently coupling the fairly high impedance antenna to the low impedance transmission line—thereby performing the function of a transformer. The explanation of this is simple. At the top, where the spacing is wide, the characteristic impedance is high and comparable to that of the doublet; at the bottom, where the wires are close together, it is low to match the low impedance of the transmission line.