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REVOLUTIONARY ELECTRICAL MACHINE TO AID SUPERPOWER

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A novel electrical machine which is expected to revolutionize transmission of electrical power is being exhibited for the first time at the British Empire Exposition at Wembley, England.

It is a "transverter", a piece of apparatus that performs the function of both transformer and rotary converter and changes ordinary low pressure alternating current into high pressure direct current.

It is expected that the realization of the vast superpower project of the United States will be hastened by this invention, since it will make easier the interconnection of various power lines and sources.

Electrical engineers have long desired to use high voltage direct current on transmission lines in place of high voltage alternating current which is standard today. The economical transmission of electrical energy over long distances requires the use of high voltages, and the higher the voltages the greater the range of economical transmission. It has not been economical, however, to make generators for voltages higher than 6000 to 10,000 volts. In practice this pulsating current of relatively low voltage is put through transformers and boosted to the higher voltages, often 33,000, 66,000, 150,000 and over higher, necessary for transmission over any long distances.

But the successful operation of high voltage alternating current transmission systems requires high technical skill. The switching off or on loads is likely to cause surges in voltage which often damage the line. Very heavy insulation is required as a result. Due to the fact that new generators feeding into a line must make their current match the current of the line exactly, in phase and frequency, the electrical characteristics of present day transmission lines must be carefully controlled.

Direct current at high voltage is admitted to be practically ideal for transmission purposes, avoiding practically all troubles encountered in alternating current lines, but it has not been used due to the lack in the past of a device that will transform and convert a.c. into d.c., as the new transverter does.

The new transverter is the invention of W.D. Highfield and J.D. Calverey, engineers in the research laboratory of the English Electric Company. Since

1918 tests leading to the perfection of the new machine have been made secretly at the Preston plant of that company. Exhibition at Wembley of a transverter of 2000 kilowatt output that delivers 20 amperes at 100,000 volt direct current was the first intimation of success of the research. A sister machine to the one exhibited takes direct current off the transmission line at high voltage and drops it down to low voltage alternating current that will supply industrial motors and lights.

Only the brushes on the transverter rotate, thus avoiding many of the troubles of other electrical machines. The transverter utilizes the fact that the rotating magnetic flux caused by a three phase alternating current flowing through a stationary winding will generate current in the coils of a stationary iron ring armature completely wound with a continuous coil of wire, with ends connected. Such an armature is known as the "Gramme ring" type and such a phenomenon is the basis of every three phase electric motor, one of the most common types used. If the brushes in contact with the armature rotate at a speed equal to the rotating flux, then the whole combination will act as a direct current dynamo, thus successfully changing alternating to direct current. In practice an ordinary transformer is substituted for the Gramme ring. By connecting several such units in series high voltage direct current is obtained.

The parts of the transformer that carry the high voltages are stationary and can be insulated and cooled by immersion in oil which is considered the most efficient method.

Distribution systems employing alternating current of different phases can be supplied off the same direct current transmission line by the use of step-down inverters of proper construction. This is expected to be especially useful when two systems join as they do in California, where the central section operates on 60 cycle and the southern section operates on 50 cycle a.c. At present the connection is made through motor-generator sets.

News of the invention in England of a transverter for converting and transforming alternating current into direct current is received with interest in engineering circles in America.

In America the same problem has been approached from a different direction by engineers of the General Electric Company who are known to be working on a vacuum tube apparatus that accomplishes a similar conversion of alternating to direct current. This tube, called the "kenotron", has been built in capacities as high as 1000 kilowatts, and used on power transmission lines, but it has not yet been made commercially available. The kenotron operates on principles similar to the electron tubes that are used in radio apparatus, and differs from the transverter radically in that it has no moving parts.

Engineers declared that only the future will disclose which type of apparatus will come into general practical use.

There is one physician to every 724 persons in the United States, one to every 1,087 in England, and one to every 2,000 to 2,500 persons in Central Europe.

THE LIVESTOCK WAR IN CALIFORNIA

By George M. Rommel

About the time that it became clear to everyone that the United States would have to take a hand in the late unpleasantness with the Kaiser, a bureau chief in the Navy Department gained the everlasting gratitude of all good Americans by ordering a shipload or two of machine guns simply on his personal word as a gentleman that the bill would be paid when war was finally declared and Congress provided the money to carry it on.

Another war, of a different kind, is now waging in American territory and another bureau chief, this time in the civil service, went the navy man even one better. He not only ordered his supplies without waiting for a declaration of war but mobilized his forces and threw them at the enemy the instant his presence was known.

What's the war about, and who is the bureau chief who had the courage to order his army into action without waiting for someone to tell him to act?

Now if you were in California you would not have to ask what the war is, for that is where it is. It is a fight to stamp out the breaded foot-and-mouth disease in livestock which came in from the Orient on a navy boat which docked at Mare Island Navy Yard in San Francisco Bay. From the Navy Yard the disease got into a herd of hogs, from there to the slaughter houses at West Berkeley and from there to dairy herds.

Oh, well, who is interested in sickcows and pigs?

Not so fast. Do you think 20 cents a high price for a quart of milk or 45 cents a pound too much to pay for good roast beef? How much more would you like to pay? Because more you will certainly have to pay, or go without, if foot-and-mouth disease ever gets a firm foothold in the cattle herds of the United States. The disease does not affect human beings, and it is not often fatal among livestock, but it is one of the most highly contagious diseases known and it spreads like a forest fire in the most unaccountable ways if it is not held in check. Cattle which get it run a very high fever, become lame and slobber profusely. Often the Hoofs drop off. Fat cattle lose flesh rapidly and milk cows drop off in their milk flow or stop milking entirely.

If the disease were allowed to spread over the entire country, it is doubtful if we could ever get rid of it. Most of our herds would have it every now and then, none would be safe and the amount of meat and milk produced would be very much less than it now is. Not only would there be less milk and beef, but less mutton and lamb, less ham and bacon, fewer pork chops and sparer ribs, and buckwheat cakes would look out of place without the breakfast sausages on the plate beside them. Woolen clothes would cost more and altogether it is a harrowing picture.

As bad as all that? Well, not quite as bad perhaps as the complete absence of the breakfast sausages. One could still have meat and milk at a price. But it would be a price that would pinch. If foot-and-mouth disease once really gets loose in this country, we would have to pay more for every quart of milk and every pound of meat that we used - how much more can only be gussed at, but probably at least 5 cents a quart for milk and 10 cents a pound for meat. Not

counting the milk that is manufactured into butter, ice cream, condensed milk, cheese, and so on, we would have at that rate a billion dollars to charge to foot-and-mouth disease; if we include the manufactured milk, that would make another million. For the increased meat bill, we could add another billion and half. In fact, we might consider ourselves fortunate if we got off with three billion dollars - nearly as much as the whole United States Government now costs us - every year. We could not look for much help from foreign countries, for the disease takes its toll in nearly every part of the world. Our country keeps itself free because we believe that it is wiser to spend a few million dollars occasionally than to have to suffer the loss of many millions or even billions every year.

This is the fourth time in 25 years that this scourge has invaded the United States. It came in 1902, in 1908, and 1914. This outbreak has caused greater losses than those of 1902 and 1908, but it is not nearly so serious as the one of 1914 which spread over 22 States and paid its respects to the District of Columbia before it was finally stamped out. It has been confined to one state, California, and there it bids fair to remain, because a bureau chief in Washington was ready and watching and because he did not wait until Congress gave him the money to go ahead. That man is Dr. John R. Mohler, chief of the Bureau of Animal Industry of the United States Department of Agriculture.

About noon on Thursday, February 21, Dr. Mohler received an official telegram from California describing the symptoms of some sick cows in a dairy in Alameda County. The wire stated that foot-and-mouth disease was suspected. Dr. Mohler asked that results of the tests be reported to him promptly. The next day, Friday, was Washington's birthday and a holiday everywhere, but early Saturday came the message, "Suspicious confirmed". The Bureau's "army" was instantly ordered into action. Three California counties were absolutely quarantined, the movement of livestock in others was restricted, experienced men were rushed to the scene of action, the Government Printing Office in Washington broke all records for service to the Departments by getting out a Bureau quarantine order over night, and Mohler told Congress that he would need a million dollars and probably more for the Government's share of the expenses, but that he could not hold up the campaign to wait for the money.

This sort of business costs a lot of money. Men must be drafted to fill the ranks, for the Bureau has only a skeleton organization in disease-war peace times. Not only must salaries and traveling expenses be paid, but disinfectants must be bought, laborers hired to dig trenches in which the condemned animals are buried and the animals themselves must be paid for. There is no compromise - no quarter. Every animal known to have the disease is killed, the skins slashed with sharp knives, the carcasses covered with quick lime and all buried in a trench six feet deep. It is a public measure and the appraised value of the animals destroyed is borne equally by the Federal Government and the State.

Before President Coolidge had a chance to affix his signature to the bill appropriating the money asked for, Mohler had obligated the Government for more than the million dollars that Congress intended to give him. Next he asked for a million and a half more and Congress promised it readily with no objection from anyone except one irascible member.

Thousands of animals of all kinds have been slaughtered and buried. After several flare-ups the disease now appears to be under control and the federal and state veterinary forces in the battle zone are now engaged in a grim effort to destroy all traces of the disease.

TWO THOUSAND TIMES SWEETER THAN SUGAR

By Dr. Edwin E. Slosson.

If you find that you have to order sugar oftener than you like just tell or telephone the grocer to send up a pound of alpha-anti-aldoxime of perillaldehyde. If he fills the bill you will find that this single pound will go as far as a ton of common sugar and is likely to last the family some twenty years by which time the price of sugar may have fallen to a reasonable level.

Probably the grocer will say, as usual, that he is just out but has something just as good. Which, as usual, will not be true, because there is nothing just as good, or at least none has yet been discovered, or anyhow been tasted. For, curiously enough, the above mentioned compound, whose name I shall not repeat since space is short, was known ten years before anybody thought of tasting it. It was first made in Germany in 1910 and duly analyzed and described. But chemists are not in the habit of licking off their fingers whenever they get something on them in the laboratory. If a Freshman student has that propensity he gets cured of it before the end of the term without the teacher's saying a word to him about it. So it was not until 1920 that a chemist, making the aforesaid compound, found to his surprise that it was sweet, and surprisingly sweet at that. He was a Japanese named Furukawa, and I don't know whether he licked his fingers or not but if he did it was a lucky lick for he rushed off to the patent office and got the stuff patented as a sweetener. It is made from the essential oil of a plant known to the Japanese as "Shiso" and to botanists as "Perilla".

The interesting thing about it from a chemical standpoint is that it is not in the least like any of the natural sugars in structure although it is composed of the same elements, carbon, hydrogen and oxygen, the common elements of all foods. Yet if the same number of atoms of the same elements, attached to one another in the same way, are arranged in a slightly different position the resulting compound is not sweet at all.

The record for sweetness has hitherto been held by saccharin, which was made by Ira Remsen, afterwards president of Johns Hopkins University, while he was a student. It is a coal-tar derivative, and also no relation of the sugars, yet it is several hundred times sweeter than cane sugar. Just how much sweeter depends upon the degree of dilution. If the water solution is strong one part of saccharin equals 200 parts of sugar. If more water is added the sugar solution loses its sweetness in proportion to the dilution but the saccharin holds out better so that 700 times as much water can be added to the saccharin solution as to the sugar solution before it ceases to taste sweet.

Dulcin, another coal-tar compound, is about half as sweet as saccharin, yet, strange to say, the addition to saccharin of only 50 per cent. of dulcin will nearly double its sweetness. A third coal-tar compound, about a hundred times as sweet as sugar, goes under the name of glucin.

Another super-sweet was reported at the recent meeting of the American Chemical Society by A. W. Dox and Bruce Houston of Detroit. This is some 300 times sweeter than sugar and is altogether unlike any of the others in structure. It contains chlorine and is called "hexyl-chloro-malonamide", but if it is ever made marketable it must be given a name that is less of a mouthful. A slight change in the make-up of its molecule produces a compound that is not sweet but intensely

bitter. The tongue is a good chemist. Yet having been trained through thousands of years by the tasting of fruits where sweetness usually means wholesome nutriment, it is fooled by these new compounds, which are much more sweet but not nutritious at all. Still they have been found convenient for diabetics who can not digest sugar and in a case of war when sugar cost too much.

The discovery of these synthetic sweets raises embarrassing questions in love and literature. In courtship nothing less than superlatives will pass current and no self-respecting maiden will feel flattered to be called "honey" or told that she is "sweet as sugar" when she knows that there are similes far sweeter. Many of our girls are studying chemistry nowadays and know too much to accept inferior substitutes in candy or compliments. Chemical names do not fit easily into verse, even when verse is most free and freaky. But doubtless a tabloid trade form will be devised, such as "saccharin", "dulcin" and "glucin". The compound that I mentioned first, the Japanese one, could be condensed to "peri" or "perilla". The former has already acquired poetical connotation through Moore's peri outside paradise, but the latter would fit more neatly into valentine rimes, such as

The rose is red, the violet blue,
Perilla's sweet, and so are you.

LOFTIEST PHOTO EVER TAKEN NOW EXHIBITED

A photograph of the surface of the earth taken from the highest altitude at which any such photograph has ever been made is now on exhibition at the War Department at Washington. The picture is of Dayton, Ohio, and it was taken from 32,220 feet above sea-level by Lieutenants Macready and Stevens of the Army Air Service at 11 a.m. of May 2. The altitude is a little more than six miles above Dayton.

Although the usual ground haze was present when the picture was taken it is exceedingly clear in definition, and automobiles and street cars can be distinguished in the streets six miles beneath the camera. This result was accomplished by use of a "minus blue" ray filter, which cuts out the blue light of the ground haze. Super-speed film was used, enabling the employment of a very deep ray filter, giving exceptional clearness.

As the temperature was 62.5 degrees below zero Fahrenheit when the picture was taken, special electric warming devices had to be used for the camera as well as for the aviators.

The use of ray filters to cut out ground haze makes it possible to take pictures of equal clearness at any practicable altitude, Army Air Service experts say. The haze occurs up to an altitude of from 8,000 to 10,000 feet, above which the atmosphere is exceedingly clear. The problem is merely one of using a camera with focal length sufficient to get a clear focus on an object six miles or more away. The airmen say that with a focal length of 20 inches they could take a clear picture of the ground from a height of 48,000 feet.

There are about 26,250,000,000 hen eggs laid in China every year.

CATERPILLARS SHUN FLOWERS; PREFER NETTLE DIET

The "Painted Lady" may be a charming creature when she is a grown butterfly, but as a caterpillar she has peculiar tastes. Such is the verdict of Dr. H. W. Stone of the University of California, who with some misgivings has been watching the wholesale invasion of his suburban residential grounds near Los Angeles by an army of said caterpillars. One might have expected the destruction of the delicate cultivated plants of the district; such is the usual technique of traveling pests. Not so. Passing up a delicious crop of sweet clover, to say nothing of dainty garden flowers, the voracious invaders are stripping the nettles and field mallow, two of the principal weed nuisances of the neighborhood. Stinging plant hairs, reeking with formic acid, leaves and everything but bare stalks disappear into the cast-iron digestive apparatus of the crawlers.

This obliging insect (*Vanessa cardui*) in maturity is a beautiful mottled brown butterfly. The fluttering army invaded southern California some months ago in unprecedented force, advancing from Mexico. At Easter time they were found by Prof. Loye Holmes Miller sweeping over Death Valley itself, regardless of desert terrors and traveling about fifteen miles an hour. Countless eggs have been laid all over the southern counties, and countless offspring are living off the fat of the land without bothering mankind in the least.

SURGEONS PEEP BETWEEN RIBS WITH NEW DEVICE

Doctors may now take a peep between the ribs of a patient and perform operations on the surfaces of the lungs without removing a section of a rib. An instrument which makes this possible has been invented by Dr. J. J. Singer of the Washington University School of Medicine, St. Louis. It is smaller in diameter than a lead pencil, carries a small light and lenses, and may be inserted between the patient's ribs after the administration of a local anesthetic.

By use of this thoracoscope, as it is called, the surgeon may see just what conditions are at the surface of the lungs and may perform small operations without further incision.

FISH THRIVE ON WAR

Although war and famine have in recent years made a fair start at the extermination of the human race over large areas, the races of fish have been immensely benefited. War called many fishermen away from their nets, famine and revolution disorganized society and made nets hard to get and markets uncertain. Fishing declined and the fish have multiplied. This is particularly the case in southern Russia along the Black Sea where fish are reported to be larger and more abundant than in many years. They are likely to continue so, for owing to the economic disorganization of the country fishing tackle is hard to obtain and the fishermen are neither so numerous nor so efficient as formerly.

The area of the Pacific ocean is greater than that of all the land in the world, and the volume of its waters is six times that of all the land above sea-level.

LABRADOR INDIANS PRACTICE FASHIONABLE PSYCHOLOGY

By F. G. Speck,
Professor of Anthropology, University of Pennsylvania.

(Prof. Speck has spent parts of the last ten years in an intensive study of the Labrador Indians, winning their confidence and living among them. He recently returned from a spring visit to that queer combination of Stone Age and ultra-modern culture.)

Delving, through research, into the mental life of the red-skinned furhunters of the subarctic regions of North America would hardly be thought of as a profitable means of getting into closer touch with believers and practitioners in so-called practical psychology. Assuming that their culture life in its material and mental backgrounds is that of the early new-stone age, this milieu would seem to be the last place to hope for such knowledge. Yet it seems positively true that the Indians of the interior of the Labrador peninsula possess a doctrine of soul and spiritual control to which modern theories along similar lines can offer little that is new.

Students of Coue, Freud, Strindberg, Lodge and others, if they could convene with the philosophers of the wandering Montagnais and Naskapi hordes in the Labrador wilderness, would find themselves in an atmosphere where their convictions of spiritual control are put into daily practice.

Let us examine the setting of the scene for such beliefs by looking northward across the Labradorean wilderness and simultaneously backward in human history to the era ending with the great glacial movements that took place not less than 10,000 years ago.

Over the burnt wastes of the high plateau of the interior of Labrador wander within their paternally inherited family hunting territories, not many more than 3000 Indians who live solely by hunting and fishing - and we may add by dreaming, since the success of their vital activities depends entirely upon the directions and revelations that come to them from their soul-spirits in dreams. They have long been known to the French, whose Jesuit missionaries met them in the 17th century, as Les Montagnais, "the mountaineers" of the English. Their name is derived from the character of their desolate country.

They call themselves almost universally, *ilmuts*, "men". They are divided into many small bands which take their local names from their territories. Then there are the so-called Naskapee, "Heathen", whose territories stretch far into the northern interior plateau from the "great lake", Michikamats, and Hamilton river to Ungava. The coastal fringe of their country is occupied by the Eskimo, possibly 2500 in number.

The life of the natives is beset with struggle - against hunger, cold, and death by accident. Isolated for about ten months of the year in their interior ranges, they live in small family groups camped in birch-bark, skin and canvas tents in suitable places on their inherited districts where they can do nothing for the support of life but hunt and trap. Their diet is solely flesh, except for the berry-crop which comes in late summer.

In the winter they move from one station within their proper limits to another by means of sleds and toboggans pulled by dogs, themselves, for the most

part, walking upon snowshoes. The winter is hard and their exposure great. Their physical constitutions have developed a capacity for resistance to the elements which is almost incredible. And as we shall see, despite the impoverishment of their industrial and economic life, their mental constitutions have achieved a stage of development that entitles them to rate with modern thinkers along certain spiritual and philosophic lines.

The one concept pervading the economic and religious life, and the fine arts of the Indians of this branch of the Algonkian linguistic family, is the belief of the soul-spirit residing in each human individual. The soul-spirit bears three names, atcak, meaning simply "soul", nishtut, meaning "my corresponding being", as near as we can put it in English, and mishtabeo, "great man". The last term is the general one used because it is more polite not to refer directly to the soul. This soul-spirit is imperishable. It lives after the death of the body. It may transcend to another person or to offspring. The "great man" is master of the body. It seems to represent the "ego". To secure success in life, by hunting in the case of this race, health, immunity from famine and accident, the individual depends entirely upon the control, the revelations, and protection of the "great man". It is to him a god, a companion-mate, a source of power, a conscience, a will, a sub-consciousness, an essence of self, without which he would be an inert mass of matter - as he is when deceased.

The soul-spirit is a somewhat independent entity with whims and desires of its own which it is the individual's duty to gratify when he becomes conscious of them. The soul-spirit reveals itself in dreams, and likewise directs the individual for his own welfare. The soul-spirit may be cultivated and strengthened through devotion to its revelations and complying with its desires, or it may be left to languish and finally depart through neglect - resulting in the demise of the individual. The soul-spirit is controllable in proportion to the service it receives from the individual. And service consists in heeding its dream and conscience admonitions.

SIMPLE SCIENCE

BY WOW

INK

As civilization advances we make more and more use of written words. We can't trust a man's spoken word nowadays so have to have it in writing. This writing must not fade away too soon. Many modern lovers use an ink that fades in about three weeks in order to avoid legal complications when the infatuation passes away. This sort of ink is also very useful in paying your tailor with a thirty day note.

Ordinary writing ink is pretty permanent. It's made by mixing nutgalls with copperas, water and gum. This gives a brownish mixture which doesn't show up well on paper, so a little indigo blue or other blue dyestuff is put in. This mixture oxidizes slowly in the air and gets nearly black. Copperas doesn't contain any copper - that's how it gets its name. It contains iron, and the nutgalls contain tannin. The iron combines with the tannin and gives a light colored substance which gets black in the air. The gum keeps the ink from spreading all over the paper when you write. With some people, it fails to do so however.

We owe a great debt to ink. By its agency knowledge has spread to all parts of the globe. Directors of correspondence schools are particularly indebted to it - perhaps more so than the students. Many preachers would find themselves much more popular if they would make more use of ink by publishing their sermons instead of trying to vocalize them. Ink is a blessing and comfort to the weak-hearted, for they can send sulphurous epistles to their enemies without fear of physical injury to themselves.

Printer's ink contains lampblack, linseed oil, resin and soap. Many newspapers should use more soap in their ink to keep them clean. Colored printing inks are the same except the lampblack is replaced with painters' pigments. Editors have to be careful what ink they use or their journals will be yellow.

OYSTERS EAT ALL DAY AND MOST OF NIGHT

Oysters apparently live to eat. Prof. Thurlow C. Nelson of Rutgers College, who made a study of the lives and diets of these favored adjuncts of the diet of man, has found that eating is their main activity. At least it takes up the most of their time. But they like a warm dining room.

If the temperature of the water in which they live is as high as 68 degrees Fahrenheit, Professor Nelson found that the oysters ate about 20 hours a day. At least they kept their shells open and sucked the water in through their gills during that period. But a sudden drop in temperature often resulted in a decrease in the number of hours of activity. When the water temperature fell below 40 degrees Fahrenheit, the oysters seemed to lose their appetite and feeding practically ceased.

The reason for this continued enjoyment of their rations on the part of the oysters may be seen from a consideration of the minute size of the creatures which form their food. Most of these, diatoms, spores, pieces of algae, etc., are so small that we need microscopes to see them, and it takes many millions of them to keep an oyster on the active list.

RAREST SEA SHELL

One of the rarest sea shells in the world is called the "Glory of the Sea". In shape and appearance it suggests an unfolding rosebud. Only twelve to fourteen are represented in collections today. Three specimens of this beautiful mollusk were found in 1838 by a British scientist on a Philippine coral reef. A few weeks later, the reef was destroyed by an earthquake.

The first man to attempt polar exploration through the air was S.A. Andree, a Swedish pioneer in aeronautics, who started from Spitzbergen in 1897 with two companions in a balloon, and has never been heard from since.

Milk of magnesia, the common remedy for indigestion, comes chiefly from magnesite mined on the island of Euboea, off the east coast of Greece.
