# SCIENCE NEWS

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## ELECTRIC WELDING

ELECTRIC welding and the flame cutting of metals are revolutionizing the building of large machines and replacing the making of large expensive castings. How this development is saving industry and the public many thousands of dollars annually is told in a report of the Engineering Foundation just issued.

Although for many purposes castings have advantages all their own, the report explains, many delays and losses are caused by the difficulties in the making of large castings for specially designed machines.

Suppose a large electrical generator is being built. Huge castings, specially designed, are necessary for the base. As the designer bends over his drawing-table the parts take shape in his trained imagination. Constantly questions run through his mind: Can the pattern-maker build this? How must he divide it so that the pattern can be obtained from the sand mold? Will the molten metal flow into this part readily? Will the flowing metal "cut" or "wash" the mold here, injuring the casting in more ways than one? Can that pocket be vented of the gases liberated from the molten metal? Will this part crack away as the metal cools and shrinks? Will that very thick part be spongy?

Under the guidance of experienced engineers and metallurgists, the designers, pattern-makers and foundrymen provide for one difficulty after another. Finally, after months of preparation, the hour for the great adventure arrives and the metal is poured. More days go by as the casting is slowly cooled, stripped and cleaned. Tons of "gates" and "risers" are cut away. A rigid inspection is made, possibly with the aid of X-rays in search of hidden flaws. Then the casting is shipped to the machine-shop.

One after another certain parts of the casting are machined on boring-mills, planers or other large machine tools. The last face is being machined; the tool gradually uncovers a narrow crevice. Probing reveals a thin cavity extending into the casting at a place where soundness and strength should be unquestionable. The casting must be rejected! Months of time are irrecoverably lost, together with great expense incurred in foundry and machine-shop and for transportation. And the same risk must be taken again!

Now, through the use of flame torches that cut metal easily and welding devices that join together metals so effectively that they seem to have always been one, standard steel slabs, plates, bars and other structural shapes easily obtainable in the open market are built up into structures superior to the castings formerly required. The steel surfaces, unmachined, are good enough for many purposes. Dimensions are very close to standards without further work. Wastage of metal and weight are much reduced.

The designer enters a new field of wider freedom wherein materials and technique more closely satisfy the principles underlying his work. He no longer has to use metal an inch thick and liable to breakage where a tough ⅛-inch plate is much better. Construction may begin as soon as designs are developed. There is no waiting for castings. Designers no longer are hampered by economic necessity to reutilize old patterns. Storage for patterns and their loss by fire disappear. Some machines can be completely fabricated in less time than formerly was consumed in making patterns. Predictions of cost and delivery can be made with less uncertainty.

In the new technique, steel up to 8 inches thick is flame-cut within 1/32-inch of desired dimensions, with surfaces smooth enough to be painted or requiring but light cuts if they are to be machined. Flame-cut parts match satisfactorily for welding. Half-inch plates are cut at a rate of 15 inches a minute, and 2-inch plates at 7½ inches. Welding is done by electric arcs on machines which make most of the operations automatic and more rapid than hand work.

## GAS AS FURNACE FUEL

GAS made from bituminous coal was declared the ideal household fuel of the future in a report by Professor S. W. Parr, of the University of Illinois, to the first national fuels meeting held in St. Louis under the auspices of the American Society of Mechanical Engineers.

Charging that the average home and apartment heating plant is guilty of producing most of the smoke nuisance of cities, Professor Parr predicted that raw coal would eventually become obsolete as a fuel and that instead the soft coal would be processed to produce a solid smokeless fuel more desirable than anthracite, gas of high quality and tar from which drugs, dyes and many other chemicals can be obtained. Smokeless combustion, high efficiency, cleanliness and convenience give gas a status unapproached by any other fuel.

Why smoke practically always results from the burning of bituminous coal in ordinary furnaces was explained. When coal is heated it gives off gases, among them marsh gas and ethylene. Before marsh gas will burn it must be heated to a bright cherry red heat, about 1,200 to 1,300 degrees Fahrenheit, and ethylene requires a temperature half as great. If such gaseous products of coal strike a cool surface that lowers their temperature below their ignition points, or if there is not enough oxygen to allow them to completely combust, they become smoke producers instead of giving off heat.

In the large steam-generating plant the production of great volumes of smoke is an unnecessary extravagance, inefficient, wasteful, unsanitary and avoidable. Proper combustion can be controlled in a very effective manner by such devices as slow and evenly distributed additions of coal or by special setting of the boiler, hence the modern mechanical stoker and the elevated or elongated boiler settings to provide both space and time for the combustion of gases before cold surfaces are encountered.

The case, however, with the average household or apartment heating unit is entirely different. Here the high heats do not prevail. The mechanical stokers as well as the spacious combustion spaces are absent. Moreover, the man of the house or the janitor has other duties to perform, whereupon he fills the combustion chamber to the limit and sets the dampers for a prolonged period of automatic control, during the major part of which period the so-called heater is simply a device for stewing off tars and vapors of inconceivable variety as to composition, odor and filth for the effective work of polluting the atmosphere. In the very nature of the case, such conditions must exist and continue to prevail in any household appliance where raw coal is fed into the furnace. No matter by what name the furnace or the coal is known, by any other name they would smoke just the same, and the worst part of the picture is not fully presented until mention is made of the fact that as a result of exhaustive studies made in many congested centers, it is demonstrated that the major part of the smoke nuisance has its origin in the domestic chimney and in the larger units of flat and apartment buildings where combustion conditions in the furnace are substantially as described above.

## THE CORN BORER CAMPAIGN

"THE corn borer campaign has been successful and has accomplished as far as is humanly possible the object set out to accomplish." This is the verdict given out by the executive committee of the international corn borer organization on the ten-million dollar war on the corn pest undertaken last spring.

A census of the borer population by actual count has been made in approximately 750 townships in the heavily infested states, declares Dr. W. H. Larrimer in charge of corn borer work at the U. S. Bureau of Entomology. Results of surveys in New York, Pennsylvania, Ohio and Michigan show that there is an average of 13 borers per 100 corn-stalks in the campaign area as opposed to an average of 8 borers per 100 stalks last year. Though this means an increase of 50 per cent. for this year, it compares favorably, the entomologist pointed out, with the 300 per cent. gain made by the borers in 1926 when no general control measures were in operation. The increase came about this year in spite of a cleanup that destroyed 95 per cent. of the borers. For the pests' powers of reproduction, Dr. Larrimer explained, are such that five of an original population of 100 will produce an average of 150 more adult corn borer moths. This condition notwithstanding, the Department of Agriculture considers the campaign more effective than it had dared expect.

In the light of the fact that the corn borer feeds on some 225 plants with an expressed preference for a diet of corn-stalks, eradication of the pest is considered impossible. Of twelve natural insect enemies of the corn borer imported into this country from Europe in the last six years with the hope of checking its spread, six have become established. While such means of biological control necessarily take years to become effective it is regarded as a very hopeful indication that half of the species of corn borer enemies introduced have become permanent residents.

Of the ten million dollars appropriated last spring to fight this foe of America's corn crop, no money has been used for quarantine or research purposes. The bulk of the appropriation has been spent on compensation to farmers for extra work, special machinery, field equipment and supplies and a far-reaching educational program.

Special commendation is ceded to the farmers that cooperated in the war on the pest by the entomologists, agronomists and agricultural engineers at work on the problem, Dr. Larrimer declared.

## SUBSTITUTE FOR BUTTER

A BUTTER substitute that will contain as many calories and more vitamins than the old-fashioned product of the cow can be made available at a low price, scientists in London declare.

In view of the general shortage of dairy products, chief source of the vitamins necessary for health and growth, Drs. O. Rosenheim and T. A. Webster, of the National Institute for Medical Research, have suggested to the scientific journal, *Nature*, a cheap and effective butter substitute. Fats from the livers of such readily available animals as sheep, calves and oxen, they report, contain ten times the amount of vitamin A as exists in cod-liver oil.

"The well-known skill of the margarine manufacturer," Dr. Rosenheim explains, "should enable him so to incorporate the liver fats with his product as to convert a dietary article, already identical with butter in calorific value, into a cheap and palatable product of equal biological efficiency, so far as vitamin A is concerned."

The no less important rickets-preventing vitamin D, another variable constituent of butter, can be supplied by mixing in small quantities of irradiated ergosterol. This is a recently discovered product of great potency, believed to be the parent substance of the anti-rachitic vitamin. After exposure for regulated periods of time to ultra-violet light, it is capable of curing human rickets in as small doses as from two to four milligrams daily.

"The margarine manufacturers," continues Dr. Rosenheim, "have therefore at their disposal, if they care to make use of them, means which should make a perfect biological substitute for butter accessible, without unduly raising the price of margarine. Moreover, by carefully controlled methods of manufacture, it should be possible to supply a product of constant vitamin content, superior in this respect to natural butter, the vitamin content of which depends on too many uncontrollable factors in the food supply of the cow."

## EXPEDITION TO NUNIVAK ISLAND

HAVING to get school children to act as interpreters for him was the unusual experience of Henry B. Collins, Jr., ethnologist of the Smithsonian Institution, who has just returned from an expedition to Nunivak Island, in the

Bering Sea. Mr. Collins and his associate, T. Dale Stuart, are the first scientists to visit this Alaskan island or to study its people.

"No adult on Nunivak speaks English, except for the school teacher and her husband, who are sent there by the U. S. Bureau of Education," said Mr. Collins in describing his expedition. "The children are taught English at school and speak it very well. Since they have heard only these two Americans use the language, the little Eskimos have reproduced some of the tricks of speech of their teachers, even to saying, 'Oh, dear,' which is a frequent expression used by the American woman."

The primary object of the visit to this inaccessible island was to collect skeletons and to measure the people and study their habits.

"The people live in houses made of drift logs," said Mr. Collins. "They excavate to about three feet and build part of the house underground, for greater protection against the cold. Sod is placed over the wooden structure, and in winter when the sod and the foundation soil freeze, they make a kind of thermo-blanket and really keep the house warmer than it is in summer. This is fortunate, for the people have no house fires. Wood is scarce, and every log that drifts in from the sea is urgently needed for kitchen fires and for building purposes. Snow houses are unknown among these Eskimos, and indeed no Alaskan Eskimos live in the round snow huts supposed to be typical of the far north.

"When the teachers came there four years ago, they found the natives of one village living in four large houses, one for the men and three for the women. The unmarried men lived regularly in the men's council house, and the married men lived there for about five months in the year. This sort of separation of the sexes is found among native tribes, but nowhere have the ceremonies required that the men stay away from their wives for so great a part of the year. The teachers persuaded the natives to build separate houses, better ventilated and with less crowded conditions, so that now they have their own homes."

In their journey through villages along the southwest and west coast of Alaska for about 400 miles the scientists found only about ten white men and women, the teachers of the natives. In these remote villages and on the still more remote island of Nunivak, they measured over 125 full blood Eskimos, the first natives to be studied in this part of Alaska. The expedition also collected about 200 skulls and 50 complete skeletons which have been brought to the Smithsonian Institution for examination and measurement.

Mr. Collins realized why Nunivak Island is avoided by ships when the schooner in which he was returning to the mainland broke a rudder in a storm and was in considerable danger of being sucked into the treacherous sea. The Eskimo crew succeeded in repairing the rudder and landed the scientists and their valuable skeleton collection safely at St. Michael.

## ITEMS

ANOTHER brand of streptococci, the round little germs that look like tangled strings of beads under a high-powered microscope, is engaging the attention of Drs. George F. and Gladys H. Dick, responsible for the development of scarlet fever antitoxin. At their laboratory at the John McCormick Institute for Infectious Diseases they have found that the streptococcus isolated from skin lesions of erysipelas is capable of causing a sore throat without any of the skin manifestations of this much-dreaded disease appearing at all. This result is analogous with that obtained in their scarlet fever work when it was discovered that the scarlet fever streptococcus may cause sore throat and rise in temperature without the suspicion-arousing rash being present. As in the former experiments, the inoculations were made on healthy adults who offered themselves as volunteers, according to the report of the research made to the American Medical Association.

CONFIRMATION of the modern medical teaching that sunlight is the best preventive of rickets, the disfiguring and crippling bone disease of childhood, may be found abundantly in China, according to Dr. A. Hartmann, a German physician, who has had long experience in the Far Eastern republic. The Chinese houses, especially of the poorer class, rarely have glass in the windows, he reports; and therefore there is nothing to prevent the ultra-violet rays, which can not penetrate ordinary glass, from pouring into the houses. And cases of rickets are exceedingly rare among the poorer Chinese in spite of the malnutrition and lack of sanitation all too prevalent among them.

FROM Halemaumau, the great pit of the Kilauea volcano, great avalanches of loose material have been precipitated into the depths and although there have been no lava outpourings such as appeared in July the slides are taken as indicating continued unrest of this volcano. Many tons of débris have fallen into the pit and partly buried one of the cones, according to a report of the Hawaiian Volcano Observatory. Portions of the wall usually quiet are scarred by slides. Vulcanologists expect that the inner crater of Kilauea will over a period of years gradually fill with lava. The present activity is just an early stage of this portion of the volcanic cycle.

WORKING for the Food Investigation Board, Dr. D. Haynes and Miss H. K. Archbold have found that the keeping quality of apples varies with the chemical composition. If the apples contain a good deal of nitrogen, protein that is, and not much sugar, they will only keep for a short time. If they do not contain much protein and plenty of sugar, they will show excellent keeping qualities. Further evidence that this is the true explanation has been obtained by Dr. Franklin Kidd and Dr. Cyril West, working at Low Temperature Station, Cambridge. They have studied the respiration of apples as a measure of their vital activity. During the "breathing" process the apple oxidizes its store of sugar, and when the store is exhausted death soon follows. Dr. Kidd and Dr. West found that the apples that keep well, those with low protein and high sugar content, respire more slowly than those with poor keeping qualities.