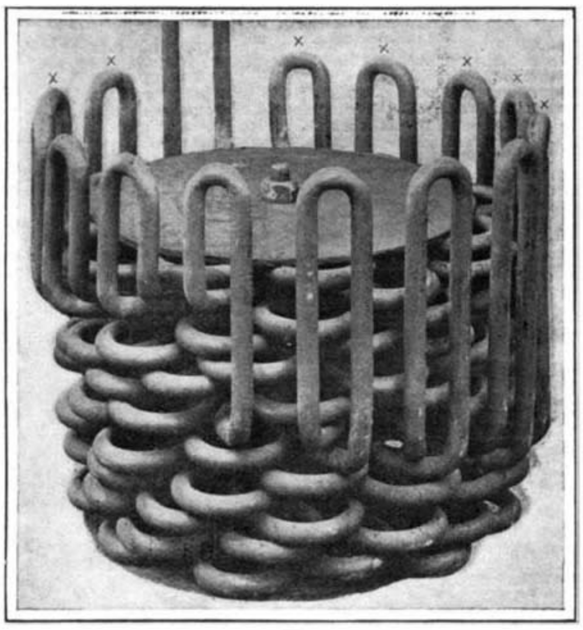
AUTOGENOUS WELDING WITH THE OXY-ACETYLENE HIGH-PRESSURE BLOWPIPE.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

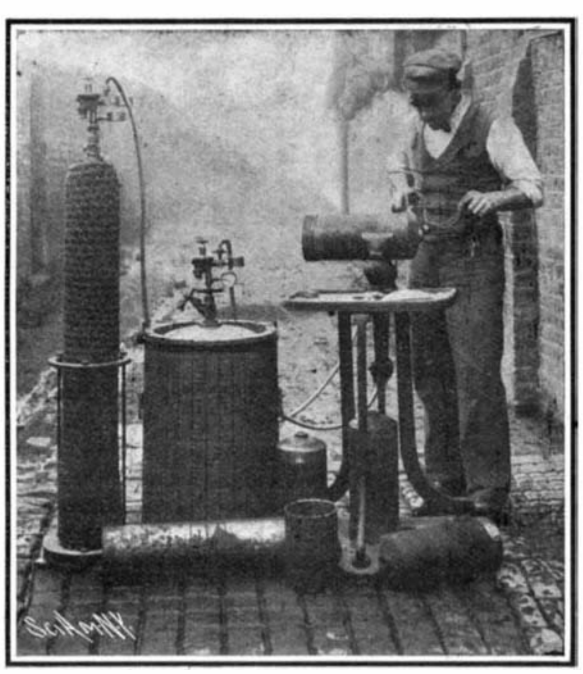
Some interesting experiments have recently been carried out at Birmingham to demonstrate the possibilities and efficiency of welding by means of the oxy-acetylene blowpipe. With this system a temperature of over 7,000 deg. F. was obtained, which is a heat far exceeding that procurable with the oxy-hydrogen flame, with which a maximum temperature ranging from 3,600 to 4,500 deg. F. only is possible. Furthermore, whereas a cubic foot of hydrogen will only develop about 12,000 British thermal units, a similar quantity of acetylene will develop nearly five times as much—57,000 British thermal units.



A Typical Example of Welding by the Oxy-Acetylene Blowpipe. The Tubes Were Welded at the Points Marked by Crosses.

For certain classes of welding, where especially intense heat is requisite, the oxy-acetylene blowpipe is eminently suitable, and during the past two or three years this system has come very extensively into vogue. At first considerable difficulty was experienced in the devising of a blowpipe for utilizing this gaseous mixture, together with the problem of storing the acetylene with complete immunity from premature explosion. These two obstacles, however, have now been successfully surmounted. The perfection of the process for storing the acetylene in a dissolved state has removed any liability of danger, provided ordinary care is displayed, while a highly efficient burner has been devised. At first it was considered that the acetylene could be employed with burners similar to those utilized for oxygen and hydrogen, but it was found that owing to the premature dissociation of the acetylene, whereby carbon was freely liberated in the form of graphite, the burners rapidly became choked, and then the hydrogen only in conjunction with the oxygen assisted the burning, the result being that the same effect was produced as if only pure oxygen and hydrogen were used, with the additional disadvantage of the burners becoming clogged.

A new process whereby these drawbacks are entirely and successfully eliminated has been perfected by the Acetylene Illuminating Company, of Lambeth, London, the notable feature of which is that the burner is so designed that the acetylene only dissociates in the actual burning. With this burner both the oxygen and the acetylene gases are utilized under pressure, instead of only the former being supplied to the burner under pressure. Demonstration has proved that by supplying both the gases under pressure a much higher factor of efficiency is obtained, while at the same time this arrangement enables the design of the burner to be considerably simplified. Furthermore, equal gas pressure dispenses with continual adjustments of the burner, as is the case where two varying pressures are being supplied to one flame, so that disarrangement of the burner is not a constant liability.



The High-Pressure Oxy-Acetylene Flame in Operation, Showing the Two Cylinders Containing the Respective Gases.

It is also much easier to maintain the adjustment of the flame with both gases supplied at an equal pressure, and once the regulation has been obtained at the correct point, it can be left. With a high-pressure oxy-acetylene blowpipe also, it is possible to obtain a more complete combination of the two gases, which is impossible in an appliance where the supply is maintained under varying pressures, and this attainment conduces to the higher efficiency. This feature too is of great importance, since there is a decreased consumption of acetylene to accomplish a fixed amount of work, rendering this system more economical in operation, and this economy more than compensates for the difference in cost between the dissolved and the crude acetylene supplied direct from the generator.

In order to insure the complete combustion of acetylene, a theoretical proportion of 2.5 parts of oxygen to 1 part of acetylene is required, but practical experience has shown that the requisite quantity of oxygen is much less, varying from 1.6 to 1.8. This factor, however, is completely influenced by the standard of purity in relation to the oxygen. This divergence between theoretical and practical requirements is attributable to the fact that by the high-pressure system the extra oxygen necessary to complete combustion is drawn from the surrounding air.

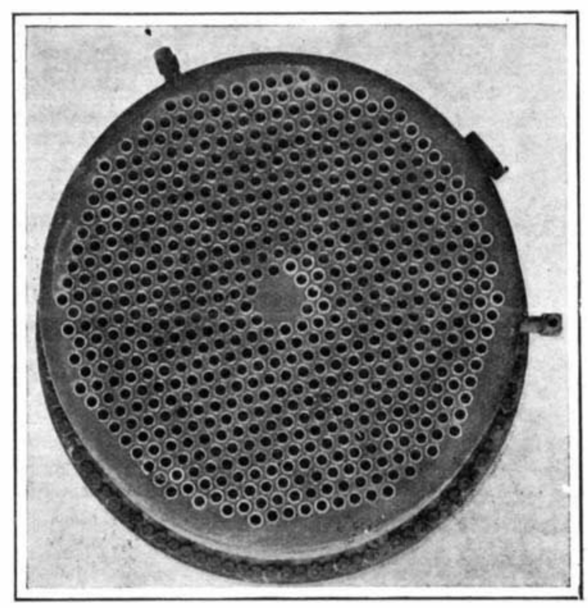
The high temperature of the flame from the oxy-acetylene blowpipe as compared with that of the oxy-hydrogen flame is due to the fact, that whereas in the latter the temperature is limited to the dissociation temperature of steam, in the former the temperature is limited only by the dissociation temperature of carbon monoxide, which is considerably higher than that of steam. Acetylene is an endothermic gas consisting of carbon and hydrogen, and with a high-pressure blowpipe it is split up into its two component parts at the base of the flame. The carbon only participates in the burning, since it will combine with the oxygen at a higher temperature than the hydrogen, so that the latter is left free, and constitutes a protective zone to the small cone at the nozzle of the blowpipe, where the carbon is burning, and which is the point of maximum temperature—approximately 6,300 deg. F.

The perfection of a system of dissolved acetylene has contributed in no small degree to the utility and safety of the oxy-acetylene blowpipe. The cylinder is filled with some porous substance, such as asbestos or charcoal cement of a fixed porosity, and is then thoroughly saturated with a fixed quantity of acetone. The latter is a liquid hydrocarbon, and has the peculiar property of absorbing twenty-five times its own volume of acetylene at atmospheric pressure and 59 deg. F., and will continue doing so for every atmosphere of pressure that is applied to the gas. The general arrangement in regard to the cylinders is to so regulate them that they contain ten times their own volume of acetylene for every atmosphere of pressure, so that at that pressure they contain one hundred times their own volume of acetylene. Any possibility of the gas exploding within the cylinder is completely removed.

This process is particularly adapted for welding split tubing, flaws in tanks or boiler plates, boiler tubes, bicycle frames, and similar work. The accompanying illustrations show two typical welding operations that were carried out by this process. With the high-pressure system the operation is considerably simplified, since the operator, once he has obtained the desired regulation of the flame, can concentrate his sole attention to the work in hand, and does not continually have to adjust the supply, as is the case with varying pressures. As regards the time occupied in welding various thicknesses of plates, and the consumption of gas for the purpose, the following information is supplied by the French Bureau Veritas:

Thickness of Plates.	Approximate Quantity of Acetylene Consumed per Hour.	Approximate Time per Running Foot.	
Millimeters.	Cubic Feet.	Minutes.	Seconds.
1	0 3	2	.
2	0.7	2	45
3	1.2	3	..
4	2 3	6	45
5	3.6	8	30
6	5.3	10	..
9	13.0	15	..
10	16 1	16	45
12	26.2	20	..
15	43 8	26	45
20	84.0	33	30
30	252.0	60	..

It is essential, however, that the acetylene should be quite pure, as certain impurities incidental to acetylene, unless removed, are detrimental to the weld, and tend to render the joints either imperfect or brittle. Owing to its general superiority to the ordinary oxy-hydrogen blowpipe flame, it is extensively supplanting the latter process, while at the same time it possesses certain advantages over electric welding, inasmuch as no elaborate preparations or heavy initial expenditure in regard to plant are entailed.



These Tubes Were Welded in Place by Means of the Oxy-Acetylene Blowpipe, With Which a Flame Having a Temperature of 7,000 Deg. F. Was Obtained.

The Age of Animals.

Some of the compound earth worms that have been produced at the Marburg Zoological Institute by grafting together parts of different worms have lived from 8 to 10 years after the operation. It is fair to infer that uncombined earth worms may reach the same age, a fact that was unsuspected and would have been deemed improbable. This discovery suggests a comparison with the ages of other invertebrates for which, however, few reliable data are available. Among the generally short-lived articulate animals lobsters and fresh-water crabs are said to live 20 years, queen bees 5 years, and queen ants from 10 to 15 years. Most mollusks, too, appear to be short-lived, but the fresh-water mussel is said to live 12 or 14 years (the pearl-bearing species more than 50 years, according to some writers), the sea snail, *Natica*, 30 years, and the *Tridacna*, or "yellow clam," 100 years. But the life of most invertebrates of all classes appears to be limited to one or a very few years. Hence it is the more surprising to find several well-authenticated examples of longevity among the lowly, plant-like sea anemones, of which one species has been known to live in aquariums 67 years and others from 10 to 50 years. It is impossible, in the present state of science, to explain these remarkable exceptions to the law which governs nearly-related animals living under similar conditions.

The same difficulty confronts us in the vertebrates. The great age of elephants (150 to 200 years) finds a plausible explanation in their great size and the unfavorable conditions for procreation, but there is no known explanation for the ages attained by some birds (the raven 100, the eagle 104, the vulture 118, the falcon 164, and the parrot a far greater number of years). The longevity of the giant tortoises, which are said to live 300 years, may also be explained by their bulk and their small expenditure of energy, but it is difficult to see why such small vertebrates as pike and carp should live as long as elephants, or toads as long as horses (40 years).—Adapted from the German of Prof. E. Korschelt in Die Umschau.

The year 1907 will see more railway mileage constructed in Ontario and Quebec than in any year since the original lines were built between Montreal and Toronto. The Canadian Pacific Railway intends constructing almost an entirely new line from Montreal to Toronto. The Mackenzie and Mann Syndicate has also important projects in eastern Ontario and in the vicinity of Montreal which will enable it to secure the shortest route between Ottawa and Montreal. The Canadian Pacific will complete the Toronto and Sudbury branch and the Guelph and Goderich Railway. The Grand Trunk Railway will be particularly active in the western section of Ontario between Toronto and Windsor, but the chief work will be rather in the western provinces in building the Grand Trunk Pacific Railway. The Delaware and Hudson will complete its line along the south shore of the St. Lawrence to Quebec.