

the oven before alluded to or while actually on the table by means of the blow-pipe.

Having got the work in position on the table and the necessary adjustments made by means of clamps, &c., the operator proceeds to don his blue goggles, for the heat and the glare from the oxy-acetylene flame are so intense as to be extremely injurious to the naked eye.

Taking up the blowpipe, he turns on the cocks and ignites the gas issuing from the nozzle, and then spends a few moments in regulating the flame to suit his requirements for the work. Holding the blowpipe in the right hand, the operator, in cases where pre-heating in the oven is impracticable or injudicious, proceeds to thoroughly heat the whole of the work for the reason already explained by passing the flame rapidly over it.

After pre-heating, a special flux in powdered form is applied to the surfaces to be united, more flux being added from time to time during the actual welding. The purpose of the flux is to clear the surfaces, promote the fusion of the metal, prevent any undesirable chemical combinations from taking place, particularly that known as oxidation. The composition of this flux differs according to the metal to be worked, and its preparation is a work of specialists, and is often a jealously-guarded secret.

The actual welding operation is now commenced; the operator takes the welding rod in his left hand, and with the blowpipe in his right directs the flame on to the bevelled edges and the welding rod simultaneously. The metals from both immediately assume a liquid form and blend or alloy with one another, and as they do so the operator, giving a peculiar rotary motion to the jet of flame meanwhile, slowly proceeds with nozzle and welding rod to follow the course of the prepared trough, until eventually this becomes filled with new metal from the rod that has coalesced with that of the original casting while in a fluid state. The welding rod, of course, is composed of similar kind to the work.



SEAPLANES AND MINE-SWEEPING IN THE NORTH SEA.

OUR double-page picture in the current issue touches upon one of the most dastardly phases of the present war in which the Prussian Huns have violated every International law of humanity and decency, under the cloak of their wonderful creation "Kultur." That seaplanes could be of some assistance in dealing with mines has long been thought possible, and our artist has endeavoured to depict the method of "sweeping" employed in this very hazardous task. That the dangers are recognised by the Government is evidenced by the message from the Lords of the Admiralty last week to Captain Massey Dawson, R.N., commanding the mine-sweeper section at Grimsby, expressing their high appreciation of the men's service, courage, and devotion in carrying out their duties off the Yorkshire coast.

Apropos of this work, a very human article appeared in the *Daily Chronicle* on Monday last from the pen of Mr. J. J. Bell upon these "heroes unsung." When the history of the war comes to be written, the part played by the commanders and crews of the trawlers engaged should have a high place of honour. In regard to the co-operation of seaplanes the following references are instructive:—

Reprint from "The Navy League Annual," 1913-14:—

"AEROPLANE versus SUBMARINE.

"There is one phase of utility for aeroplanes which deserves special mention, namely their efficacy as a guard against submarines. I gather that the submarine is a continual nightmare to every battleship. The aeroplane should be regarded as the 'four angels round

Having filled up the trough to overflowing in the manner described, the blowpipe is removed and the weld is then effected. It only remains to anneal the casting and to remove all trace of the join by means of a file and emery cloth, and the job is complete.

Simple, is it not? So far as one can see, there is no more skill required than in simple soft soldering, and yet the full success or otherwise of the operation depends, as has already been pointed out, chiefly upon the skill of the operator.

Judgment, such as can only come from long experience, is necessary in the preparation of the work, with every movement of the blowpipe and welding rod, and particularly in the regulation of the temperatures; skill, the result of long practice, is required for the regulation of the flame and the manipulation of the blowpipe in such manner as to prevent oxidation, the formation of bubbles, the burning of the metals and "adhesion," for the slightest trace of these faults, so almost unavoidable by the inexperienced, are each and all sufficient to result in a weak join and perhaps in utter failure. A knowledge of the mechanical and physical properties of all the various industrial metals and alloys, and the ability to determine within definite limits their quality or composition, are another necessary qualification of the expert welder, and not the least important among them.

It will cause no surprise to learn, therefore, that the really expert welder can command a very high wage, but has first of all to pass through a long apprenticeship.

One of the firms who make a speciality of the welding process in connection with the repairs of automobiles and aeroplanes is Messrs. Barimar, Ltd., of 1, Poland Street, W., to whom we are indebted for the accompanying illustrations, and for their courtesy in permitting the inspection of some of this important work in process of accomplishment.

my bed' of our childhood's prayers. The air-scout can see the submarine when no one else can, and generally when the submarine cannot see him. In 1912, when a submarine attack was made up the Firth of Forth, the submarines got up to Rosyth unseen by anybody except the aeroplane pilots, who had them in sight all the way. Into anything like clear water an air-scout can see vertically to any depth to which most submarines can dive at present, and when a submarine is running with her periscope showing, the shaft of the periscope leaves a wake which is easily seen from above, though not from any distance at an angle. Thus, both on the high seas and for coastal defence, the aeroplane as a detector and destroyer of submarines has a distinct place in the scheme of things."

Extract from "The Great War," Part 9, Chapter XIV:—

"The most important thing in mine-sweeping is to discover the minefield. Only too often its existence is not known until some unfortunate ship has come to grief in it; but sometimes a mine breaks loose and is seen before it has done any damage; sometimes a mine is carelessly laid and floats idly, but still anchored, on the surface; while the seaplane has added another factor of security inasmuch as an observer up aloft can, on a fine day, and when the sea is not too greatly disturbed, see some considerable distance below the surface, and, perhaps, detect a mine-field in time to warn a following fleet of its existence.

"When the mines have been located the sweepers get to work—and dangerous work it is. They steam in pairs, a strong steel hawser being stretched between them. To this hawser two heavy 'kites' or sinkers are attached, so as to keep it well to the bottom, and the trawlers then proceed slowly to 'sweep' the mined area. As the hawser is drawn along the bottom, it comes into contact with the wire ropes that connect the mines with their anchors, and drags them along. In this way many mines are exploded by coming into contact with each other, and if any are brought to the surface intact they are generally destroyed by light guns being fired at them."