Oxygen and Pure Water for Health.

In a lecture on the advantages of vegetarianism in malarial climates, by Doctor J. H. Kellogg, he speaks of the necessity of an abundance of oxygen and pure water to insure good health.

There are no purifying agents for the blood like pure air and pure water. Oxygen is a general house cleaner, it saturates the blood, and thus reaches every part of the system, while water is just as good and necessary for cleansing the tissues on the inside of the body as it is for keeping the outside of the body clean. The notion that many people have of purifying the blood by putting something into it is absurd—as though impure substances could have any purifying effect. Would soiled clothing be much improved by being washed in a decoction of burdock root or sarsaparilla? Let one with blue lips and pallid face start out briskly for a run, and in a short time he comes in with rosy lips, bright eyes and an altogether different countenance. The oxygen which he has been taking in has served to wash out the effete matter and burn it up, and he is a new man. Then take plenty of exercise in the open air, live in well-ventilated rooms, eat simple, wholesome food, and drink freely of pure water, and you will need no other blood purifier.

REMARKABLE EXPERIMENTS WITH LIQUEFIED AIR AND LIQUEFIED OXYGEN AND OTHER LIQUEFIED GASES.

Professor Dewar recently delivered a lecture at the Royal Institution dealing with the above subject, in the presence of a large auditory, with Lord Kelvin, president of the Royal Society, in the chair. We follow the report given in the *Engineer*.

Professor Dewar began by thanking those who had presented the Royal Institution with the machinery and appliances which would enable him to show the experiments of that evening, and at that early stage of the proceedings he felt bound to thank his two assistants, Mr. R. N. Lenox and Mr. J. W. Heath, for their arduous work for some time past in preparing for the demonstrations of that evening, in the course of which he should use up a hundredweight of liquid ethylene, which had been weeks in manufacture from alcohol and strong sulphuric acid, and compressed in the laboratory. He was thus enabled to go farther than in his lecture at the Faraday Centenary. The apparatus before them in the theater was supplied by means of pipes from the laboratory with liquid ethylene and with liquid nitrous oxide; the latter was used to cool the apparatus in the first instance.

He first filled a test tube with liquid oxygen, of which he said that he should probably use a pint in the course of the evening. They would notice that it was not clear, but looked milky, from the presence of some impurity, of which impurity he would say no more, as he did not know its cause. He would, however, pass the liquid through filtering paper as one would filter water, and they could see that it came through quite clear; on throwing an image of the test tube and its contents upon the screen, the liquid oxygen was seen to be of a cold pale blue color. It was boiling violently at the temperature of the air, with a hissing noise, and giving off clouds of, apparently, white smoke, due to the freezing of the moisture in the adjacent air of the theater. Liquid oxygen boils at —180° below the zero of the Centigrade scale, as determined by thermo-electrical measurements.

Here a liter of liquid oxygen was placed in a flask, and deposited on the lecture table, from which flask Professor Dewar took some now and then, when required in the experiments. He then drew attention to the following table:

Boiling Points—Below the Freezing Point of Water.

	Boiling point Below F. P. of W.	Boiling point. At 5 to 10 mm. pres.
Carbonic acid	— 80 deg. C.	— 116 deg C.
Nitrous oxide	— 90	— 125
Ethylene	— 103	— 142
Oxygen	— 184	— 211
Nitrogen	— 198·1	— 225 solid.
Air	— 192·2	— 207 solid.
Carbonic oxide	— 193	— 211
Nitric oxide	— 153	— 176
Marsh gas	— 164	— 201 solid.

Professor Dewar next showed that liquid oxygen is a non-conductor of electricity, and that a spark one-tenth of a millimeter long, from a coil machine which would give a long spark in air, would not pass through the liquid. It gave a flash now and then, when a bubble of the oxygen vapor in the boiling liquid came between the terminals. Thus liquid oxygen is a high insulator.

As to its absorption spectrum, the lines A and B of the solar spectrum are due to oxygen, and he showed that they came out strongly when the liquid was interposed in the path of the rays from the electric lamp. Dr. Janssen had recently been making prolonged and careful experiments on Mont Blanc, and he found that these oxygen lines disappeared more and more from the solar spectrum as he reached higher altitudes. The lines at all elevations come out more strongly when the sun is low, because the rays then have to traverse greater thicknesses of the earth's atmosphere.

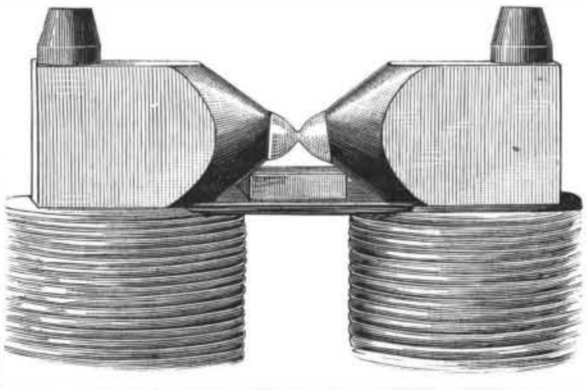
Here Professor Dewar, by means of liquid oxygen, and its evaporation accelerated by a high exhaustion pump, liquefied some common air in an open test tube, at the ordinary pressure of the atmosphere. It came down clearer and "smoked" less than did the liquid oxygen; it also boiled more quietly. This liquefying of common air, he said, is useful, as by its evaporation they would be able to get lower temperatures in the future than had hitherto been reached.

He then spoke of Michael Faraday's experiments in 1849 on the action of a magnet on gases placed between its poles, and in subsequent experiments he employed the magnet, now historical, which had been used by Faraday. He also drew attention to the following table, in which + means "magnetic," and — means "negative."

Magnetic Relations of Gases—Faraday.

	In Air.	In Carbonic Acid.	In Hydrogen.	In Coal Gas.
Air	0	+	+ weak	+
Nitrogen	—	—	— strong	—
Oxygen	+	+	+ strong	+ strong
Carbonic acid	—	0	—	— weak
Carbonic oxide	—	—	—	— weak
Nitric oxide	— weak	+	+	
Ethylene	—	—	—	— weak
Ammonia	—	—	—	
Hydrochloric acid	—	—	— weak	

Professor Dewar stated that Becquerel was before Faraday in experimenting upon this subject. Becquerel allowed charcoal to absorb gases, and then examined the properties of each gas. He thus discovered the magnetic properties of oxygen to be



MAGNETIC ATTRACTION OF LIQUID OXYGEN.

strong, even in relation to a solution of ferrous chloride, as set forth in the following table:

Specific Magnetism, Equal Weights—Becquerel.

Iron	+	1,000,000
Oxygen	+	377
Ferrous chloride solu. sp. gr. 1·4334	+	140
Air	+	88
Water	—	3

Professor Dewar then took a cup made of rock salt, and put in it some liquid oxygen, for the liquid does not touch rock salt, but remains in it in a spheroidal state. The cup and its contents were placed between and a little below the poles of the magnet. Whenever the circuit was completed, the liquid oxygen rose from the cup and connected the two poles, as represented in the cut, which is copied from a photograph of the phenomenon. Then it boiled away, sometimes more on one pole than the other, and when the circuit was broken it fell off the pole in drops back into the cup. He also showed that the pole of the magnet would draw up liquid oxygen out of a tube. The magnetic property of liquid oxygen, he said, is about 1,000 as compared with 1,000,000, the magnetic power of iron. The cooling of a body, he added, increased its magnetic power. Thus, cotton wool, cooled by liquid oxygen, was strongly attracted by the magnet, and a crystal of ferrous sulphate, similarly cooled, stuck to one of the poles of the magnet.

The lecturer remarked that fluorine is so much like oxygen in its properties that he ventured to predict that it will turn out to be a magnetic gas.

Common air, he stated, liquefies at a much lower temperature than does oxygen, and one would expect the oxygen to come down before the nitrogen, as stated in some text books, but unfortunately it is not true. They liquefy together. In evaporating, however, the nitrogen boils off before the oxygen. Here he poured two or three ounces of liquid air into a large test tube, and a smouldering splinter of wood dipped into the mouth of the tube was not re-ignited; the bulk of the nitrogen was nearly five minutes in boiling off, after which a smouldering splinter dipped into the mouth of the test tube burst into flame.

Professor Dewar then poured out a wineglassful of liquefied common air, and presented it to the chairman, cautioning him to hold the glass only by the lower portion of the stem.

Between the poles of the magnet, all the liquefied air went to the poles; there was no separation of the oxygen and nitrogen. Liquid air has the same high insulating power as liquid oxygen. The lecturer remarked that the phenomena presented by liquefied gases present an unlimited field for investigation by many workers. At such low temperatures they seemed to be drawing near what might be called "the death of matter;" liquid oxygen, for instance, had no action upon a piece of phosphorus dropped into it; and once he thought, and publicly stated, that at such temperatures all chemical action ceased. That statement he now withdrew, for he had found that a photographic plate standing in liquid oxygen could be acted upon by energy coming from outside, and at a temperature of —200° C. was sensitive to light.

His friend, Mr. McKendrick, had tried the effect of these low temperatures upon the spores of microbe organisms, by submitting putrefied blood, milk, and such like substances for one hour to a temperature of — 182° C.; they afterward went on putrefying. Seeds, also, withstood the action of a similar amount of cold. He thought, therefore, that the experiments had proved that the idea of Lord Kelvin uttered some years ago was possibly true, when he suggested that the first life might have been brought to the newly cooled earth upon a seed-bearing meteorite. He lastly drew attention to the following estimates by different scientific men as to the cold of stellar space: The temperature of space, Herschel, — 150°; Hopkins, — 38·5°; Fourier, — 50°; Pouillet, — 142°; Pictet, — 274°; Rankine, nothing.

Care and Management of Tools.

The following points on the management of a machine shop, which are extracted from an article in the *Tradesman*, will prove of value to those interested in this subject.

For much of the boring done in a machine shop, the upright drill, with the automatic feed, can be used to very great advantage; it has been found much more convenient than a boring lathe, and fully as efficient. A machine of this class should not be used for ordinary rough drilling; this may be performed upon a lighter and cheaper machine. For light drilling, a small, quick-running drill press, with hand feed, is suitable. By the use of universal chucks, and drills of uniform diameter throughout, including the shanks, the necessity of having a set of drills for each drill press is avoided.

Every machine shop should be provided with a tool room, but this does not necessarily imply that all of the tools should be kept there or returned each time after being used; this, in many cases, incurs a great loss of time. This rule should be observed in the case of large, valuable tools which are seldom used, but it does not apply in the case of small drills, cold chisels, wrenches, etc.; the tool room should, however, have duplicates of all tools used in the shop.

So far as possible, a regular system should be observed in the sizes of nuts, bolts and tap bolts, so that solid wrenches can be used upon them. Whenever tools require repairing, by dressing, tempering or otherwise, they should be returned to the tool room, and it should be the duty of the tool keeper to have such tools repaired and put in order without delay and returned to their places, so that there will always be a supply on hand. The old method, which allows the workman to carry the tool to the blacksmith shop and there wait until it is put in order, involves an unwarrantable waste of time.

The tool keeper must necessarily be a first-class machinist and tool maker, capable of replacing any and every tool used in the shop, and this is true even where the tools are mainly purchased, as special tools are unavoidably required occasionally in every shop. Ordinarily, every workman is supposed to keep his own tools ground and in good condition for work, but it is undoubtedly more economical to have certain tools, such as twist drills, reamers, etc., kept in order by the tool maker.

Joining Band Saws.

The following directions for joining band saws are given by the Defiance Machine Works: Bevel each end of the saw the length of two teeth. Make a good joint. Fasten the saw in brazing clamps with the back against the shoulder, and wet the joints with solder water, or with a creamy mixture made by rubbing a lump of borax in about a teaspoonful of water on a slate. Put in the joint a piece of silver solder the full size thereof, and clamp with tongs heated to a light red (not white) heat. As soon as the solder fuses, blacken the tongs with water, and take them off. Remove the saw, hammer it, if necessary, and file down to an even thickness, finishing by draw-filing lengthwise.

COAL is mined in Turkey, in Heraclea and Koslu, both on the Black Sea and about 100 miles from Constantinople. The mines at Heraclea are controlled by the Ottoman government; the Koslu mines by a private firm, Kurtschi & Co. The coal obtained is inferior in quality to the English mineral, especially to the Cardiff and Newcastle coal.