HISTORY.

The discovery of oxygen by Priestley, seems to have had an influence equally great on chemistry and Medicine. After that event new theories of respiration and disease sprang up abundantly, and the gas was almost immediately made use of as a remedy.

Amongst the earliest observers may be mentioned Count Morozzi, who, experimenting chiefly on birds found that they were more lively and animated, when confined in oxygen than in air, and also, that though ultimately they perished, they were not so strongly convulsed, and that the heart retained its excitability for several hours after death.

Injen-Housz experimented on himself, and found that inhalation of the gas caused an increase of spirits, strength, and appetite, and that sleep was made sweeter, and more refreshing, than usual.

Poulle of Montpellier in 1784 pointed out the indications, and contra-indications for its use, maintaining its value in asthma, various fevers, for restoring the asphyxiated, and prolonging the life of aged people.
Jurine of Geneva reported a case of phthisis, in which oxygen inhalations were successfully employed. Observations of a similar kind were made by Chapital. Dumas of Montpellier believed that oxygen was capable of acting as a powerful irritant.

Fourcroy, in 1879, was selected by the French Government to make experiments, and his speculations were very wide and ingenious, if somewhat ill grounded and far fetched. He believed that an animal plunged in oxygen was in a state of fever; hence that it ought to be employed only in states where there was a sensation of cold and lethargy. Thus he used it in cases of chlorosis, scrofula, dyspnoea, accompanied by pallor, rickets, and general feebleness. It seems likely that his oxygen contained a good deal of impurities, probably mostly Chlorine.

At about this period physicians seem to have constructed elaborate theories of disease, on more or less slender foundations, and busied themselves in reconciling their ideas with observed facts. The action of many drugs, and the benefit obtained from their use, was thought to be explicable by the amount of oxygen they contained or the reverse. Thus Fournier thought the value of mercurials in venereal diseases, was due to the oxygen they contained, and Burdin recommended ethers in the treatment of chest affections. Trotter thought that vegetables and fruit, owed to oxygen their value in the
treatment of scurvy, and that the essential change in this disease was a deficiency of oxygen in the blood.

In England, Beddoes published his first work in 1793, embodying his ideas on the nature and treatment of gravel, calculus, and scurvy. He made many investigations into the physiological effects of oxygen, and his general results, briefly, were:

1. That it produces a remarkable power of resisting asphyxia. When the blood of an animal contains an unusual amount of oxygen, it is better able to endure a deficiency of respirable, or even the presence of an irrespirable gas.

2. Animals which have respired oxygen resist more strongly the action of freezing mixtures.

3. The action of oxygen is localized chiefly in the muscular system.

4. That it is in the highest degree a stimulant to the heart, and blood-vessels.

The well known Pneumatic Institute was started by him, with the assistance of Davy and Watt. Here, various cases were treated. His observations were confirmed by many of his contemporaries such as Ferrier, Thornton and Gimbernat. He thought that oxygen was contra-indicated in phthisis, for the reason that an essential part of that disease, consisted in an excess of oxygen in the blood. His cases were not reported with sufficient exactness to give confidence in his diagnosis. An Institute resembling that of Beddoes, was founded by Odier, of Geneva. He
seems to have been the first to suggest the use of oxygenated water.

In Germany various observers published works, and mention may be made of Mensching, Stoll, and Ferro, in the years 1787-95. Girtanner was delighted with the results he obtained, in the treatment of intermittent fever, by arsenic dissolved in nitric acid.

During the early part of the present century, oxygen fell entirely into disrepute, chiefly on account of the adverse opinion passed on it by Pareira. It was advocated as a remedy for the last stages of cholera (Macrae in India, in 1850; Harvey in London in 1853).

In 1857 Birch published a work on oxygen, which seems to have attracted a good deal of notice. His notions are somewhat far fetched, and his cases do not bear the impress of genuineness. He treated very various conditions, and generally used other remedies as well as oxygen. Riadore's work, published in 1845, is equally absurd according to present notions. About 1860 to 1870 the use of oxygen seems to have found its way to America, and Smith wrote an essay on its action in health and disease; in the Appendix are given very numerous letters from medical men who have found oxygen of value.

In 1866 Demarquay published his work, and it appears that at about this time, there was a revival of the use of oxygen, in France.
It appears that of late years, it has almost entirely fallen into disuse, but in 1892, a case reported by Brunton and Prickett, more or less directly called forth a vigorous crop of further trials.

It seems also to have been employed in veterinary practice for the treatment of chest affections.

--- PHYSIOLOGICAL ACTION. ---

The earlier observers believed, that an over dose of the gas, would produce a state of general inflammation. They imagined that an unlimited quantity could be taken into the blood by inhalation, there to produce effects on the tissues themselves. Demarquay taught, that an animal can live in pure oxygen, and for a longer time than in the same volume of air, but beyond a certain limit it succumbs. He confined animals for more or less prolonged periods, in oxygen, and in mixtures of air and oxygen. He does not seem, in his experiments, to have provided any means, for removing products of respiration. After death the tissues presented an unusual florid appearance, and this was regarded as due to excess of oxygen. Smith repeated these experiments with variations, and found, that if proper means are used for removing impurities, animals can live indefinitely, and without discomfort, in oxygen. Demarquay thought the mixture of gases in
his chambers, produced by placing an animal in pure oxygen, and retaining it there till death, was still a respirable mixture, because it was capable of relighting a partially extinguished taper. Hence he concluded, that death was due to oxygen, and not to carbonic acid. Smith, however, found that a pint jar containing two parts of oxygen, with one part carbonic acid, would relight a taper four times. Demarquay himself says, that oxygen mixed with 10% carbonic acid forms a mixture incapable of supporting life. Smith concludes, that the redness of tissues, seen by himself and others, was due not to hyper-oxygenation alone, but to a concomitant retention of carbonic acid, the oxygen enabling the animals to resist the effects of the carbonic acid for a long time.

The experiments of Beddoes certainly tend to show, that an excess of oxygen can be taken into the system.

Regnault and Reiset confined animals in oxygen, and after a time examined the resulting gas, and found it to contain no more carbonic acid, than would have been exhaled into air in the same time. They believed that the blood becomes saturated with oxygen when air is inhaled, and can therefore take up no more, however much is presented. Smith's view was that if pure oxygen be inhaled, only so much is absorbed by the blood as is taken from air, under circumstances involving the great-
est possible physiological demand for oxygen. However he brings forward no very conclusive evidence of the truth of this proposition.

On the other hand the dictum of Landois and Stirling is precise and definite. They state that the absorption of oxygen is a purely chemical process, independent of the laws of diffusion of gases. It depends on and condition and amount of haemoglobin almost exclusively. The exception occurs to an appreciable degree, only when the blood is subjected to a very high condensation of oxygen, and under the pressure of several atmospheres (Oertel). Animals made to breathe in a limited close space, can absorb almost all the oxygen, even to traces into their blood before suffocation. (Landois and Stirling p.275).

"According to Pfluger, arterial blood is saturated to \( \frac{9}{10} \) with oxygen, to \( \frac{14}{15} \) according to Hufner". (page 61.) The serum itself absorbs only about as much as an equal amount of distilled water under similar conditions of temperature and pressure". "The free supply of oxygen certainly favours the expulsion of carbonic acid, both that part which is loosely combined in the blood, and that which is more firmly combined, but it cannot increase the amount of carbonic acid formed" (page 276) "The oxydating processes within the body, are regulated by the tissues themselves, by some mechanism as yet unknown (page 273)."
Demarquay tried the effect of injecting oxygen into the cellular tissues of animals, and also into the venous system. The results he got seem to be those produced by any non-irritating gas, such as air.

The general effects of inhaling a considerable quantity of oxygen, are described as consisting of:-
A sensation of freedom about the chest, warmth beneath the sternum, sometimes slight vertigo, general tendency of blood to the skin surface, hands and feet if previously cold, become warm, and sometimes a pricking sensation is felt. Demarquay adds, that some people have a slight sense of intoxication, gaiety, a desire for muscular exercise, a sense of constriction in the temporal region.

The effect on the pulse is not constant. It may be unchanged, accelerated or diminished, in frequency.

Occasionally a disposition to yawn constantly is noticed, and generally there occurs, after the inhalation, an inclination to sleep. Different individuals show varying susceptibilities and the effects are more pronounced, when the gas is inhaled fasting. Small quantities inhaled daily increase appetite. The excretion of carbonic acid is slightly increased, according to Smith, who made some observations on himself; these, however, were not numerous, and might be capable of a different interpretation. He also found a diminution in the
amount of urea excretion.

Bartholow relies for his authorities chiefly on Hayem and Anne. He states that oxygen energises the nutritive functions, increases appetite, slightly elevates temperature, stimulates the heart's movements, and increases the number, and stimulates the activity of, the red blood corpuscles.

On the whole, it seems that no one has satisfactorily demonstrated, that more oxygen is taken up into the system, from the pure gas than from air. None of the peculiar effects, above mentioned, were present in any of the cases to be noted afterwards. Most patients could detect no difference between the pure gas and air, except that sometimes they thought the former felt a little the colder. Increase of appetite was not striking in any of them, and when it occurred it might have been quite accidental.

The observations of P. Bert are of some importance. He found that symptoms of oxygen insufficiency set up by breathing an attenuated atmosphere, (as in the case aeronaunts of making ascents to great heights), are relieved or even dispelled, by breathing a richly oxygenated atmosphere. (Quoted by Oertel). The experiments of Richardson (Lancet September 17th. 1878 pages 334 & 774) are of the greatest interest.

It is important to carefully distinguish between the effects of oxygen at ordinary pressures and temperatures, and when these are varied.
Almost every disease, medical and surgical, at one time or another seems to have been treated by oxygen. It seems to have been regarded as a universal panacea. The cases of such men as Birch, Riadore and Beddoes do not give satisfactory impressions, and after carefully considering the question, one is reluctantly driven to the conclusion enunciated by Oertel, that the Agency of oxygen in promoting tissue change, and altering pathological processes, is not greater than that of pure air. He adds that oxygen inhalations, are most justified scientifically, in cases where the relative pressure of oxygen is considerably lowered, and in maladies attended with dyspnoea in which the blood is overloaded with carbonic acid. It can only be regarded as a temporary remedy.

A brief review will be given of some of the diseases in which it has been tried.

**ASTHMA.** Smith gives brief notes of some cases: some were cured, some relieved, a few not benefited. He found that the paroxysms were rendered less acute, and either altogether banished or made less frequent. He does not state, that he himself had a case in which more than temporary benefit was obtained though he does not seem to have employed inhalations in the intervals between paroxysms. Demarquey also quotes some cases.
Beigel gives notes of three cases, all benefited. He employed oxygen merely to obtain temporary relief, relying on other treatment to secure a permanent cure. Asthma seems to be one of the few conditions, which almost all writers believe to be amenable to oxygen. Even Pareira admitted that the paroxysms might be relieved by it.

**EMPHYSEMA.** Smith found in a case of his, that by means of oxygen inhalation the livid hue of the patient's face was lost and a fall of pulse-rate from 122 to 100, and of respiration, from 36 to 20, occurred. Benefit was only temporary, and the gas was not used any length of time. Biegel gives an account of a case in which an actual diminution of the size of the chest occurred, as well as relief of dyspnoea, and diminution of expectoration. When the patient discontinued the treatment his symptoms quickly returned.

The use of oxygen in Emphysema certainly does appear rational. It might lessen the muscular efforts needed to draw into the chest a sufficient quantity of oxygenating medium. It also seems not improbable, that Emphysema is aggravated, by constant laborious inspiratory efforts. Possibly the nutrition of the walls of the air cells might be improved, by the circulation in them of a more fully aerated blood.
GROUP etc. Smith does not seem to have met with much success in the treatment of croup. His own cases were protracted ones, and though he succeeded in relieving the dyspnoea, a fatal termination occurred, generally from mechanical engorgement of the lungs. Beigel employed oxygen in three desperate cases of diphtheria, all recovered. He believed it to be of great value both for relieving the dyspnoea, and also for combating the septic state of the blood. It is to be noted, that he adopted other measures of treatment, apparently of an energetic kind.

Demarquay employed inhalations after tracheotomy for croup "first to restore the patient, and secondly to modify the blood." He also treated a case of tubercular enlargement of the cervical and bronchial glands causing dyspnoea and threatening asphyxia. In this case however, the good result obtained seems to have been due to a diminution in size of the affected glands, and it is doubtful to what extent this diminution was due to the oxygen treatment.

PNEUMONIA. It was at first thought that oxygen was absolutely contra-indicated in pneumonia. Smith, however, makes a note of several cases successfully treated. He says that though the presence of "acute inflammation generally precludes the use of oxygen, yet when respiration is seriously interfered with, the danger from this source, outweighs all risk from any possible increase of the inflammation, which the
use of the oxygen may occasion."

It is only of late years that the use of oxygen in pneumonia has been much practised. The "Medical Annual" for 1891 - 2 and 3 contains references and notes on the subject and there can be no reasonable doubt of its efficacy in some cases. Lauder Brunton and Prickett in a paper published in "The British Medical Journal" January 23rd. 1892 say: - "It is self evident that if we can increase the oxygenating power of the air inhaled by the patients in cases where the breathing surface of the lung is diminished, we may afford great benefit, and in some cases may save life. More especially is this likely to be useful, when the interference with the respiration is of a temporary character, as in cases of acute pneumonia. - - - - - - -It is possible that an increase of oxygenating power of the respired air, for even a few hours, may turn the scale."

The case noted in his paper terminated fatally, but the temporary benefit obtained, "was so remarkable we might also say miraculous - as to awaken the greatest possible hope for ultimate success."

Other cases in which oxygen was employed are mentioned in the British Medical Journal of March 5th. 1892 (Allen & Morgan) and in the same Journal of March 12th. In these cases pneumonia was a sequela of influenza, and complicated by other conditions of

A case of double pneumonia, successfully treated by bleeding and oxygen inhalation, was reported by Foy in the Dublin Journal of Medical Science. Vol 93. 1892 p.13. 1892. Only a small quantity was used viz:—33 feet during 4 days. In this case the gas was given by a tube placed in the Patient's mouth, each inhalation lasting 15 minutes, and being repeated every 3 hours. Smith thought that in capillary bronchitis inhalation of oxygen was of specially great benefit, and he narrates a successful case of his own. He believed it would not only relieve dyspnoea, but also by diminishing excessive inspiratory efforts, it would have a good effect in averting mechanical engorgement of the lungs.

Oertel in his article in Ziemmsen's Cyclopaedia, says that oxygen is indicated in acute exacerbations of chronic catarrh, emphysema, and asthma, attended with cyanosis, and dyspnoea. Also that it is justified theoretically, in croup, in order to support life till the air passages have again become free, and in asphyxia and chloroform poisoning.

PHTHISIS, was one of the first treated diseases by oxygen, subsequently from a fear that inflammatory action might be set up, it was abandoned. Demarquay treated numerous cases himself, and gives also the
experience of other physicians. His cases are reported carefully, and enough of the physical signs narrated to render the diagnosis clear.

Generally after the inhalations were commenced, an improved state of nutrition was seen, and he thought also, there was a diminution of cough, expectoration, and night sweats. Occasionally, the inhalations were stopped for a time, because a rise of temperature occurred, or a little haemoptysis. He also cites cases of Herve de Laveur, who, out of nine cases treated, obtained excellent results in three. The usual dose at first was 5 litres morning and evening, and was gradually increased up to as much as 45 in some cases. A noticeable improvement generally occurred within a month. Oxygen was generally the only remedy employed, in addition to such general measures as are usually adopted.

Smith seems to believe very strongly in the efficacy of oxygen, alleging that, theoretically, it ought to be of value — first, because it promotes assimilation. Secondly, the presence of oxygen in contact with tubercle would initiate a process of disintegration, which would favour its absorption. Thirdly, oxygen in contact with a wound or ulcer acts as a stimulant, promoting the formation of granulations, and if carried too far, setting up active inflammation. Hence the necessity for careful dilution.

He says, that, in the first stage of phthisis it may be given with impunity, diluted with two or three
times its bulk of air. Anything indicating local in-
flammation, should be the signal for discontinuing in-
halation. When there is profuse expectoration, or
when the physical signs indicate cavities the local
effect of oxygen, little diluted, may be tried, and fre-
quently there occurs a rapid diminution of sputa. He
quotes cases of his own, in which a decided improve-
ment was obtained. In desperate cases, where all
hope of cure is entirely gone, he thinks it renders
death easier by replacing suffocation "for the peace-
ful falling asleep of exhausted nature."

The Practitioner of May 1869, (page 276) has a
paper by Mackay, in which twelve cases are narrated
of various diseases treated by oxygen. They include
bronchitis, emphysema, phthisis, and others of a less
definable character. In conclusion, he says two of
these cases, were of an organic, and probably incur-
able nature, and these derived no benefit. The rest
obtained more or less good, and he thinks the common
condition present in them all, was venous congestion.

Demarquay mentions a case of bronchial dilation
(none tubercular), in which the sputa, at first, opa-
que, greenish and tending to adhere to the bottom of
the spittoon, after eight days treatment, became al-
most white. There also occurred a gain in weight,
and increase of appetite. The subsequent history is
not given.

1869, p. 597.) gives a brief note of 10 cases of
phthisis treated with oxygen. Other remedies of the usual kind were also employed. (good diet, cod liver oil, wine or porter, cough mixture, and for night sweats, quinins and acid). The dose was usually 3 gallons, twice a day, and the gas was diluted by allowing the delivery tube, to be placed under the nose during use. The inhalations were interrupted when ever a rise of temperature greater than usual occurred. The physical signs present in these cases, are not noted. The general result was, that there occurred an aggregate gain of weight. "In cases 1, 2, 6, 8, 9, and 10 we see a gain in the aggregate, of 49 lbs. In cases 3, 4, 5, and 7 a total loss of 7 lbs."

CARDIAC DISEASE. Smith gives brief notes of a case, in which the very remarkable amelioration occurred. The patient, previously speechless, livid, cold, with no radial pulse, and widely dilated pupils, returned to consciousness, after 15 minutes administration of oxygen.

In his second case, dyspnoea was relieved, and paroxysms often averted.

A case of mitral disease (obstructive and regurgitant) is mentioned by Shotts (British Medical Journal, March 26th. 1892). There was almost complete anuria, with general dropsy, great dyspnoea, incessant cough, and large collections of mucus though but little expectoration. Oxygen inhalation resulted in free expectoration, and relief of the dyspnoea.
It is difficult to understand, how oxygen could be of much service in relieving cardiac dyspnoea, due as it is, to slowness of the circulation, and not the deficiency of oxygenating medium in the lungs.

In diseases involving defective nutrition, oxygen has been much used, but probably with little benefit.

**ANAEMIA &c.** Smith mentions a case of anaemia and general debility, due to malignant pustule, followed by articular rheumatism. The patient who had been taking iron &c., for a long time without benefit, began to inhale 4 gallons of oxygen each morning, and, in a month's time, was able to resume business.

In his second case, iron was used along with oxygen, for anaemia, following syphilis. Demarquay narrated several cases of anaemia, and great general prostration, due to exhausting diseases.

Oxygen has been used in typhoid (Demarquay) intermittent fever (Hill) Scurvy (Beddoes, Trotter).

George H. Binter (New York Medical Journal Vol. 10. 1889, page 480) records three cases of anaemia and exhaustion, treated by oxygen. His notes are very meagre and unsatisfactory. A remark appended to his third case, is much open to doubt. 'There was a marked increase of surface temperature, in two cases after each inhalation, the thermometer showing an increase, on the tongue of about $2\frac{2}{3}$° and $2\frac{1}{2}$° in the hand.
in each case."

Kirnberger employed it in the treatment of Leukaemia, and pseudo-leukaemia. (Practitioner, Vol.32. 1884. p. 377). It has been used to reduce temperature in febrile conditions, by Valenzuela. It was used "in the form of baths, at a pressure of 750 to 1,520 Millemetres." (British Medical Journal. June 25th. 1887, p. 1400). Also in obstinate dyspepsia. (Trousseau, Clinique Medicale de l'Hotel Dieu tom. 3. p. 64). albuminuria, and diabetes. (Birch. Smith, Demarquay, Rollo, Cruikshank)

Albert Leblond published a pamphlet, which was translated into English, giving his observations on the treatment of diabetes, by means of water charged with oxygen under pressure. Notes of four cases are given, all of a most meagre and untrustworthy description. His patients, in addition to oxygen, were given some biphosphate of lime.

Oxygen has been used to clear uratic deposits in cases of gout. (Goolden. Lancet March 10th. 1866 p. 270).

In the state of coma various authors have found oxygen of value (Uraemia. by Howard Pinkney, quoted by Smith. Meningitis, supervening on acute rheumatism, reported by Smith in the New York Medical Journal, Vol 9. 1869. page 147.)

It has been found of use in treating coma from various poisons, such as opium (Beddoes) charcoal fumes. (Paul) Chlortal. Chloroform (Ducroy. quoted by Beigel, p. 272 and Foy) carbonic acid. (Charles Ball
A remarkable case of recovery from coal gas poisoning, was narrated by Lieut. Col. Elsdale, in The Nineteenth Century, for May 1891. The patient was found senseless, and apparently dead, enveloped in the folds of partially emptied war balloon. The nozzle of a cylinder of oxygen, was placed in his mouth, and a rush of the gas quickly caused him to return to consciousness. Probably in this case there was a fallacy of some kind.

Most writers have employed oxygen in the treatment of nervous diseases.


Two successful cases of oxygen inhalation in puerperal eclampsia, are published in the same Journal for June 1885, p. 250. by Favr. On p. 425, is a note of some observations on the same subject by several writers. Another successful case is mentioned on p.75. (vide also British Medical Journal, April 2nd. 1887. pp. 740. and 1374.)

Hooper (British Medical Journal, March 15th. 1862 p. 277) narrates a case of very intense, and protracted neuralgia, of (chiefly) posterior tibial nerve.
which, after resisting other energetic treatment, was rapidly cured by oxygen inhalation. The cure was maintained the following year.

Oxygen has also been used in epilepsy. In the Medical Times, Vol 2. July. 1863, mention is made of a case of "syphilitic epilepsy" cured by inhalation of oxygen, and iodide of potassium internally (gr 5. twice daily). In this case the oxygen seems to have been employed to combat cachexia. Most of the older writers thought oxygen of value in various forms of paralysis, various uterine disorders and many vague undefinable conditions.

APPLICATIONS IN SURGERY.

Demarquay tried the effect of enclosing a limb in an indiarubber bag, charged with oxygen. He thought by this method he could modify congestion and inflammation. He states that oxygen, locally produces an irritant effect, which is of value in treating atonic surfaces, and may produce inflammation in healthy wounds, if carried too far. He hoped by treating senile gangrene, in this manner to modify capillary circulation, but without good results. In one case foetor was checked, and pain relieved. In a second, the only effect was a mummification of the tissues affected. In both cases no pulsation could be felt below the popliteal artery.

Bricheteau has a note on the treatment of gangrene by oxygen baths. abstracted from a thesis by
Fourcras. Allusion is made to the observations of Laugier and Debourge on the same subject. It is claimed that the effect is:

1st. Modification of the colour of the skin of parts threatened, or already attacked, by gangrene.
2nd. Rise of Temperature.
3rd. Return of sensation.
4th. Dissipation of oedema.
5th. Diminution of pain.

Only certain cases are suitable for treatment, viz:— those in which the Chief arteries, of the limb threatened, remain pervious.

The baths are used for two or three hours daily. It seems likely that no better results were obtained than by simply keeping the limb warm.

In the Annuaire de Thérapeutique & c. allusion is made to the experiments of Regnard, with oxygen under pressure, on fermentation. He thought it capable of preventing the phenomena of fermentation in mixtures of yeast, with milk and other substances. He attempted to use oxygenated water for surgical dressings. The latter was used by Damaschine in the treatment of thrush.

According to Cash the disinfecting properties of oxygen, are nil. (British Medical Journal, February 19th. 1887. p.410.)
Inhalations of oxygen in surgical cases, have been used to restore patients debilitated by prolonged suppuration, and to prepare them to withstand the shock of severe operations, and after operations, to restore strength and appetite. (Demarquay) Also to promote the healing of obstinate ulcerations (Beddoes Birch &c.) Smith used them for a case of pyaemia following operation for stricture of the urethra. He thought that local application had no sufficient advantages over inhalation, to compensate for the extra mechanical difficulties to be overcome. He believed that the action of oxygen on wounds, by being taken into the blood, was more uniform, and less likely to be excessive. (Vide also Practitioner, Vol 32. 1884 p. 122).

Hewitt made numerous experiments on the anaesthesia, of nitrous oxide with oxygen. He says that there are three chief bad phenomena apt to accompany ordinary inhalation of nitrous oxide, viz:-- stertor, lividity, jactitation. These are due to the fact that nitrous oxide is incapable of oxygenating the blood, and are really signs of asphyxia. They may be prevented by a due admission of air, but this is apt so far to dilute the nitrous oxide, as to render it difficult to obtain anaesthesia. Hence the idea of getting rid of the useless nitrogen, and using pure oxygen. In his paper he described all his own very ingenious and varied attempts, and all kinds of apparatus, for obtaining anaesthesia by nitrous oxide.
in the presence of oxygen. His cases are carefully analysed, and he comes to the conclusion that in the large majority of cases in dental practice, the use of oxygen along with nitrous oxide, is of distinct advantage:

1st. By preventing bad symptoms.

2nd. Prolonging the period of available anaesthesia.

On the other hand he confesses, that the use of the mixed gases, involves more skill, and more attention to detail, whilst the risks of unpleasant after effects are a trifles greater. He recommends the mixture as preferable in the following conditions:

1st. Children, and anaemic, and debilitated patients.

2nd. For one who has previously exhibited great susceptibility to nitrous oxide, and has remained a very short time under its influence.

3rd. For patients who under nitrous oxide alone, have previously had unpleasant sensations (e.g. awful dreams).

4th. For those very advanced in years, or suffering from serious organic disease.

C A S E S.

The writer has himself used inhalations of oxygen for the treatment of various conditions, and appended are brief notes of some of the cases, in which they were employed.

Housewife. Has had cough and dyspnoea for upwards of 20 years, aggravated by any exertion, and generally worse in winter. As a rule has been able to get about, doing light housework, indoors, and in fine weather, going out a little. At times has had asthmatic seizures, with an increase of the ordinary amount of bronchitis, necessitating a few days in bed.

Appetite has, for a long time, been poor, and tongue very dry, fissured in all directions, and glazed. Some months ago a peculiar patchy condition of the tongue was observed, strongly suggesting ichthyosis linguae. Has had occasional severe attacks of diarrhoea, with copious liquid, yellow stools, unstained by blood, and intense nausea. Was formerly a stoutish woman, but has been losing flesh for several years. Her dyspnoea has been gradually becoming worse. Urine has frequently been scanty, and loaded with a red deposit. Uterine functions, till menopause, (at 46) normal. Pulse has been habitually rapid for some time. No oedema of legs. For last 20 years has taken in divided doses about 1 oz. of laudanum a week, to relieve her dyspnoea. Has always been temperate in alcohol, has good home, with fairly good surroundings.

No. History of tubercle in any members of family.

Present state, (December 11th.1892) Little, thin, sallow faced woman, wearing an expression of constant distress on her features. Rather anaemic.
Conjunctiva slightly jaundiced. Lower eye-lids a little puffy. Capillaries and venous radicles over malar bones are somewhat dilated. No clubbing of fingers. Lobes of ears, and finger nails, slightly cyanotic. She prefers to sit upright in a chair during the day, but can lie down on her left side, and get some sleep during the night. Resp. 50. No obvious dilatation of alae nasi. Sterno-mastoids act very vigourously and appear to be a little wasted. She breathes with considerable difficulty, and likes to grasp some cold object with the right hand to steady herself. Respiration is accompanied by wheezing noises, audible all over the room. Continually troubled by a dry, tickling cough. Occasionally spits up a small amount of clear mucus.

Appetite nil, slight nausea, no vomiting, or purging.


Considerable oedema of both legs, and thighs. This has apparently come on during the past two or three weeks. Symptoms have been much more intense for the same period.

Chest is of small width, but deep from before-backwards. Shoulders are rounded – in fact it is a smallish chest, which has assumed the ordinary emphysematous type.
On percussion, the note is nowhere hyper-resonant except posteriorly, at both bases; a resonant note is heard all over the upper half of the sternum. At the level of the fourth rib cardiac dulness detected in the middle line of the sternum, on percussion from right to left. Note approaches hyper-resonance at both apices. The area of superficial cardiac dulness is about \(1\frac{1}{2}\) in extent from right to left. (very light percussion). The normal area of liver dulness is not encroached upon in front, and only to the extent of about an inch, posteriorly. The emphysema appears most marked at both bases posteriorly, apices, and anterior margin of right lung.

On auscultation, all over the chest, inspiration rather harsh, and sibilant. Expiration prolonged and very feeble. Both accompanied by numerous crepitations and rhonchi.

No pulsation visible in epigastrium, or vessels at root of neck. Cardiac impulse not visible and can only be indistinctly palpated. Heart sounds, feeble and distant, with a tendency to reduplication of both sounds. No murmurs. Position of apex difficult to determine, apparently about the mammary line, 5th.intercostal space. Deep cardiac dulness cannot be satisfactorily fixed.

Abdomen somewhat tumid, in its lower half, from gaseous distension. Slight tenderness on percussion over liver. No ascites. No enlargement of liver or spleen. No haemorrhoids.

Was allowed to inhale pure oxygen, issuing in a free stream from a tube, placed sometimes in her mouth and sometimes in her nostrils, (according to her fancy) for a period of 15 minutes. At the end of that time, no perceptible alteration in her condition having taken place, the inhalation was stopped. It must, however, he noted, that she was excessively nervous, and afraid of something dreadful happening to her.

On December 16th, her condition remaining such as on the 11th, she inhaled in a similar fashion, pure oxygen for 10 minutes. Almost immediately after commencing the inhalation, she obtained a relief from the dyspnoea. Respirations became slower, less laboured and deeper, and at the end of 10 minutes, had fallen from 50 to 35 per minute. A slight improvement in her colour occurred also, and she certainly seemed more comfortable. Pulse unchanged. She continued comparatively easy for nearly two hours.

On December 17th, 18th, 19th, 20th, the inhalations were repeated for periods of 5 - 10 - 15 minutes, in fact she continued to inhale, on each occasion, till such time as she got relief from her dyspnoea. She never failed to get some ease, but period during which she remained comparatively easy varied from one half, to two hours. On some days had two inhalations, with good results.
On 19th. a careful examination was made of the auscultatory signs, before and after inhalation.

A very perceptible improvement was noted. Inspiration became much softer, less sibilant in character, rhonchi and crepitations almost disappeared temporarily. These effects seemed to be due to the relief of bronchial spasm.

No improvement of appetite occurred during the period of treatment. She certainly got more sleep; cough remained as troublesome as ever. No unpleasant effects whatever were noticed. For about a week before, and during, the oxygen treatment, she had in addition, a mixture containing digitalis, squill, ipecacuanha, and acetate of potash. The bowels were kept in action by drachm doses of cream of tartar, and a few linseed poultices were applied from time to time.

The temporary benefit of the oxygen was unmistakeable. The progress of the disease was not influenced in the slightest. After the 20th. other measures were tried. The patient died January 7th, 1893.

CASE II. Robert A.H. aet. 3 years 8 months.

Has been always a rather delicate child, but has had no serious illness, except a very severe attack of whooping cough, accompanied by bad stomatitis, a year ago. Made a perfect recovery ultimately, after a tedious illness.

There is a slightly tubercular history on the father's side. Mother comes of a healthy stock.
though she is herself a wan looking woman. An uncle on male side, is at present suffering from phthisis.

Present illness commenced 13 days ago; he was then noticed to be a little feverish and out of sorts. Ten days ago, a characteristic measles rash, with coryza and slight bronchitis, appeared. A moderate degree of broncho pneumonia then developed, and the illness began to assume a severe character. Four days ago the symptoms became still more serious, from an extension of the broncho pneumonia. Pulse and respiration rose in frequency, and a slight degree of cyanosis developed. He had previously taken food well, but he now began to refuse everything, was very restless, and had a good deal of abdominal pain. Bowels were constipated from the commencement of the illness and there was no vomiting. Dyspnoea and cyanosis gradually became more intense and now it appears as if he must very shortly succumb.

Present State. March 2nd. afternoon. Is now very thin, muscles soft and wasted. Was previously a fairly well nourished child. Very restless and cross, requiring constant attention. Complains of aching pains in belly. Very exhausted and distressed. Desires to be continually nursed in his mother’s arms, and can hardly be induced to lie down. Cough not very troublesome, accompanied by moist rattling noises in the chest. Considerable degree of cyanosis visible in general skin surface, but most marked in lips, ears, and finger nails. Alea nasi

Chest. Anteriorly, right side of chest moves less freely than the left. Percussion note perhaps a little impaired below clavicle, on right side, normal everywhere else. On auscultation breath sounds are somewhat feeble on right side, and perhaps exaggerated on left. No crepitations.

Posteriorly. No dulness. Over right base, as high up as the middle of scapula, breath sounds tubular in character, and abundant medium, and fine, crepitations.

On left side breath sounds somewhat exaggerated all over, a few crepitations.

Heart sounds, feeble. Otherwise, physical examination of the heart gives negative results. No displacement.

Tongue, clean and red anteriorly, with prominent papillae. Slightly furred behind. Abdomen slightly tumid and tender all over, especially its lower and right quarter. Otherwise normal. Faeces yellow, soft and free from blood.

Urine scanty, with copious sediment of urates. No Albumen.

No enlarged glands can be felt in any of the usual situations, and there are no signs of old tubercle to be discovered.

He was induced with difficulty to inhale oxygen for a period of 15 minutes. He placed the end of the tube in his mouth, and a free supply was turned on.
An improvement quickly occurred in his colour, noticeable chiefly on the cheeks, lips and ears. A free perspiration occurred. No change in pulse or respiration rate. Certainly the respiration seemed to be effected with rather less difficulty, but the child kept continually trying to get rid of the delivery tube, and it was because he objected so strongly to it, that finally the inhalation had to be stopped.

40 minutes afterwards he got a quiet sleep, lasting 30 minutes. During the day he had, previously had no sleep whatever.

In the evening his condition was practically unaltered. Resp. 62. Pulse 142. Temp. 99.6°.

With difficulty he was again induced to inhale oxygen for 20 minutes. A similar improvement in colour was observed.

March 3rd. Slept nearly 2 hours after the inhalation last night, and has had several shorter naps also. Has seemed rather more inclined for nourishment. Condition to day much as yesterday. Perhaps a little more cyanotic. Pulse 156. very compressible, regular. Resp. 60. Temp 101°. Crepitations are more abundant over both bases than yesterday. Inhaled for 15 minutes.

Evening. Has had several naps during the day and has been less restless when awake. Taken food well. Respiration is decidedly easier (40). Appears less distressed. Alae nasi not acting so strongly. Pulse 140. a little irregular, rather better filled.
Temp 101°. Inhalation was repeated for 15 minutes and during that time he fell into a quiet sleep. Colour improved, respiration fell to 28. pulse became a little stronger, free perspiration occurred, and mucous rattlings in the chest became audible within a few feet of the bedside.

March 4th. Restless night. Very fretful to-day and exhausted. Respiration 56. Pulse, 150. Temp. 101.2°. Crepitations are audible over both lungs, front and back. Percussion note somewhat impaired below right scapula, and here breath sounds are bronchial in character.

Evening. Very bad day, still more prostrate to-night. Has had two inhalations to-day, each lasting 30 minutes. Resp. 54. Pulse 140. Temp 101°.

March 5th. Had some sleep after inhalation last night, but has been very restless since. Is still more prostrate to-day. Face and lips of a dull leaden hue. Resp. 44, gasping in character. Pulse 140. Temp 100°. Physical signs unchanged, except that the crepitations are rather more abundant. Inhaled for over an hour and a very slight, hardly noticeable, improvement occurred. During the afternoon his condition became hopeless, and he died about 3 p.m. without further inhalation.

Remarks. For three days before oxygen was used, his condition was grave in the extreme, and apparently in addition to a gradually increasing pneumonia, there
was a certain amount of collapse of the lung.

In this case oxygen was thought to be of service in relieving cyanosis, inducing sleep, improving appetite, and, to a certain extent, prolonging life. It was surprising when one reflects on his state on the 2nd that he lived till the 5th. The course of the disease itself, was not influenced. On two occasions after inhalation, he coughed up a small quantity of mucopurulent sputum. The ordinary treatment of such cases, was persisted in throughout, such as careful dieting, poultices, stimulants, (sherry and brandy) and in the way of medicine, squill, and ipecacuanha and (for seven days before death) digitalis with carbonate of ammonia.

CASE III. Nancy M. aet. 8 Months. Was a somewhat puny child up to six months ago, since then has rapidly gained weight, till the onset of the present illness, which commenced March 22nd.

Parents are both healthy. No tubercular history. Has had two previous attacks of bronchitis of a mild type. Present illness commenced about March 22nd. She has had all the ordinary phenomena of severe bronchitis, and her condition has gradually become more and more critical. Has been treated by poultices, bronchitis kettle, sherry wine and brandy, and such medicines as ipecacuanha, carbonate of ammonia, ether, and small doses of digitalis.

Present Condition. April 6th. Rather under-
sized, but otherwise a fairly well developed child. Face and lips pale, of a dusky slightly leaden hue. Alae nasi acting very vigorously. Is very prostrate, and in a state of stupor, almost amounting to coma from which she is only roused with difficulty.

Resp. 82. Loud rattling noises in chest audible all over the room. Cough, up to to-day very troublesome, has now almost entirely ceased. Occasionally gives utterance to a feeble moan \\wiggly\ cry. Pulse uncountable, very small, feeble and irregular. Temp. 130. Physical examination of the chest is attended with some difficulty, and the signs are unsatisfactorily made out on account of the noisy mucous rattling. It appears that the percussion note is a little hyperresonant all over the front of the chest on both sides. A little impaired over left base. Sharp rhonchi and crepitations completing masking the breath sound, are audible all over the chest, front and back, perhaps they are more sharply heard over left base.

Heart sounds heard with difficulty. Apex beat not displaced. Abdomen normal. Urine not examined.

Inhalation of oxygen was commenced at 11 a.m. and continued for about half an hour, when the supply unexpectedly ran out. The patient died during the afternoon. It appeared that the inhalation as long as it lasted, was not of the slightest value whatever.

Housewife. Has had very good health till 6 years ago. Girlhood was spent in the country. When she was married, she came to live in town, and her husband developing phthisis, she nursed him with great devotion during a long and painful illness, till he died. Her home has always been comfortable, and she has practically been a total abstainer, till her illness necessitated stimulants. Her family history is free from phthisical taint. Mother died from Glascollaryngeal palsy. Three sisters and one brother all living and well. All well developed, and healthy looking. It seems not unlikely that she may have contracted phthisis from her husband.

Her symptoms at first were vague and indefinite consisting chiefly in a feeling of weakness, anaemia, and loss of appetite. Incipient phthisis of right apex was diagnosed as long as five years ago. She has had many attacks (at least 12) of severe haemoptysis, hacking cough, copious expectoration, occasional attacks of diarrhoea. Has been gradually losing flesh. In fine weather has been able to get out, and has not been confined to bed for more than a day or two, at once. Has usually been able to do ordinary light household duties. Has never had any swelling of the legs. Her condition has slowly but surely become more and more grave, in spite of all kinds of treatment. Lately, she has been suffering more and from dyspnoea, want of sleep, and appetite, cough and profuse
expectoration. Uterine functions in abeyance for many years.

Present State. Tall, thin, rather sallow, dark complexioned woman, considerably emaciated. Is very short of breath, and quite overpowered by any slight exertion. Is still able to come down stairs each day but has to lie down upon her sofa a good deal. Cough very troublesome, almost incessant, and very harrassing. Expectorates daily, about 8 oz. chiefly pus. Gets very little sleep during the night, and had very profuse night sweats. Appetite almost nil. Bowels rather constipated.


Chest fairly well developed.

Right side anteriorly. Some deepening above and below clavicle, expansion deficient. Note much impaired to level of second rib, hyper-resonant below. On auscultation breath sounds cavernous in character with broncophony and pectoriloquy, above clavicle, and down to level of second rib. No crepitations. Below that point, harsh, with prolonged expiration, and a few medium crepitations.

Right side posteriorly. Note impaired in inter-
scapular region, and above spine of scapula. On auscultation in these parts, breath sounds bronchial in character, with some medium crepitations. No pectoriloquy. Vocal resonance a little increased. Harsh, with a few scattered crepitations, over rest of lung.

Left side anteriorly. Some flattening above and below clavicle. Note a little hyper-resonant from apex down to second or third rib. Breath sounds, down to third rib, bronchial in character, with some medium crepitations. Vocal resonance increased. No pectoriloquy. Rather harsh below that level.

Left side posteriorly. Note impaired above spine of scapula, fully resonant below. On auscultation, above spine of scapula, inspiration is harsh, expiration prolonged, and cavernous in character. Some crepitations also audible here. In inter-scapular region, and also about scapula, breath sounds bronchial in character. Over rest of lung, rather harsh. Occasional crepitations audible everywhere.

Heart sounds normal. No epigastric pulsation. No increase of cardiac dulness, superficial or deep.


On November 4th. commenced oxygen inhalation. This day she inhaled about 2 gallons, and at once felt
dyspnoea considerably relieved. Respiration, after a short time, fell from 38 to 28. Said that she felt a slight sensation of fulness in the head, but no irritation, or heat in throat, and the gas excited no coughing. Relief continued for some hours after inhalation, and she passed a more comfortable night than usual.

November 7th. Has been inhaling 3 gallons twice each day. Dyspnoea has been relieved by each inhalation, but its effects seem to pass away more quickly than on the 4th. No other effect has been produced. Sputa unchanged.

November 12th. Has inhaled 4 gallons twice a day since 7th. No further effect has to be noted. Says she thinks she feels a little stronger, and that sputa are not so copious as a week ago.

Temp. has been taken at 8 p.m. each evening, for about 10 days. It varies from 99° to 100°.

November 19th. Ceased inhalation on 12th. Resumed again to-day, with increased dose. (5 gallons). Thinks she has rather lost ground for two or three days. Cough more troublesome, and expectoration more profuse. On 14th. and 15th. evening temperature rose to 101°, and 102°.

November 14th. No improvement. Sleeps badly. No appetite. Slight oedema of both legs, about ankles and shafts of tibias.
Inhalations were continued till December 4th.

**REMARKS.** Inhalations of oxygen, in this case, had one effect only, viz: temporary relief of dyspnoea. They have had not the slightest perceptible effect on the condition of the lungs, nor on the general symptoms of the disease, either good or bad.

During this treatment, the only other remedy used, was a 10 drop dose of liquor morphiae twice or three times a day; this she had been taking for some time previously.

**CASE V.** Ellen H. aet.5. Previously a very healthy child with healthy parents. Was taken ill about Christmas. Was out of sorts for a few days, and inclined to be feverish at night and had slight hoarseness, and a troublesome cough of rather a croupy kind. In a few days she seemed better, hoarseness passed off, and cough lost its croupiness. But during the whole of January, she was never really well, and had two or three attacks of hoarseness and cough, though alarming symptoms never developed.

Was first seen January 29th. Was then a well developed, plump, ruddy child. Pulse and temp. normal. Tongue a little furred. A few bronchitic rales were audible over back of chest. No hoarseness, slight cough, not croupy in character.

January 31st. Hoarse. Cough croupy at times, does not appear ill. Was kept in bed.
February 1st. Past a bad night. Hot and restless. Cough very harsh, and croupy. Very hoarse, though on making an effort, she can speak tolerably distinctly. Pharyngeal mucus membrane somewhat congested. Tonsils a little swollen, and red, not suppurating. On laryngoscopic examination (made with difficulty) there was visible some congestion of the false, and true vocal chords. Pulse 100. Temp. 100°.


February 3rd. Has slept very little during night, and breathing has been gradually becoming more difficult. Inspiration and expiration, both slow, and hissing. Cough almost noiseless, and very teasing. Alae nasi acting a little. No falling in of chest walls during inspiration, and no signs of broncho-pneumonia. Pulse 130. Temp. 100°. Takes food well. Inclined to break out into little sweats.

In the evening was very drowsy, but could not sleep, on account of cough, and gradually increasing dyspnoea.

February 4th. Very bad night. Continually wanted to be nursed. Hardly able to breathe except when held in her mother's arms. Has taken a little nourishment.

Till this time, the treatment usual in such cases had been adopted, viz: steaming, poulticing, &c., Parents would not allow a tracheotomy, and as a last resource, oxygen was tried. She was allowed to inhale it continuously, a small stream being caused to play over her nose and mouth. For about an hour the child appeared to get some relief. She eagerly grasped the end of the delivery tube, and held it between her lips. Respiration still continued very laboured, and no change occurred in her colour, though at first it appeared as if the cyanotic were a little less intense. She seemed to become very drowsy, and tried in vain to sleep. Perhaps she was a little less inclined to fall into a state of stupor. She eventually died, after having continuously inhaled oxygen for 5 hours.

REMARKS. It is obvious that in this case, though quite possibly, oxygen, administered as it was, secured the admission into the chest of a
quantity of gas sufficient for oxygenating the blood, it still could not relieve dyspnoea, for two reasons:—

1st. The laryngeal obstruction prevented the entrance and exit of a sufficient volume of gas, to efficiently "ventilate" the lungs. Though oxygen entered perhaps in quantity enough, carbonic acid was retained.

2nd. The chest walls could not expand in the face of atmospheric pressure because a sufficient volume of gas did not pass into the thorax.

CASE VI. Ann G. aet. 48. Married. Multipara. Housewife. Had very good health till 6 months ago, and has always lived a regular life, not overworked in any way. Her first symptoms were mainly dyspeptic, such as pain after food, flatulence, sometimes vomiting. Vomited matters never contained blood or grumous material. Has lost flesh very rapidly. For about three months has passed rather an excessive quantity of urine, often as much as 2 quarts in 24 hours. It was always pale, and free from sediment. She has never suffered from headache, or epistaxis, and has not noticed any swelling of legs, or puffiness of the eyelids. Says she was formerly a very "fresh" looking woman, and that her friends have noticed a rapid change in her complexion. Her breathing began to trouble her about a month ago, and has been gradually getting more difficult. Up to a week ago, she has been treated by a
Manchester physician for dyspepsia. But since then has been confined to bed suffering from uncontrollable vomiting and a gradually increasing dyspnœa. She therefore called in Dr. W. Sellers, who found that her urine was loaded with albumen, and was of the opinion that her symptoms were largely uraemic. His treatment consisted of free purgation, diaphoretics, and nitro-glycerine, but her condition has gradually become more and more critical.

October 16th. Has apparently been, at one time, a well developed woman, but is now considerably emaciated, and very anaemic. Appears much distressed, exhausted, and very anxious. Breathes most easily in a semi-prone position. Respiration very laboured (26). Opens her mouth very widely during inspiration. Expiration short and blowing, with puffing out of the cheeks. Frequently moans as if in great pain. Lips, ears, and finger nails, slightly cyanosed. No oedema of limbs. Pupils moderately dilated, equal. React normally. Is suffering much from constant nausea and retching.

Pulse 112, small and thin, almost thready, regular. Not of high tension. Arterial wall a little thickened, not tortuous.

Chest well formed. Slight pulsation in epigastrium, and vessels at root of neck (venous). Cardiac impulse feeble and diffuse in character, detected as far out as nipple line in fifth intercostal space.
No thrill. Deep cardiac dulness detected along a line drawn from apex to articulation of second rib with its costal cartilage. On auscultation both sounds are feeble in character. No murmur. No reduplication or accentuation. Sounds tend to approach each other in character.

Lungs normal. Urine is pale, clear. Spec. Grav. 1015. Loaded with albumen, becoming almost solid on boiling. Contains some hyaline and granular casts. Unfortunately through an accident the urea was not estimated.

Inhalation of oxygen gave great relief to the dyspnoea very rapidly. Respiration rate fell a little. Cyanosis became less noticeable, and her distressed expression was relieved. Pulse remained unaltered. Inhalation was stopped at intervals, and resumed for a few minutes when ever dyspnoea became urgent. Relief obtained was not complete, and only temporary in character, but she thought it enabled her to pass a better night than she had expected.

On October 17th. had haemoptysis. Bronchitic rales became audible in chest, along with physical signs of a pulmonary apoplexy in base of right lung. Was much more prostrate, and for some hours, lay completely unconscious with contracted pupils. Afterwards signs of oedema glottidis developed. She regained consciousness for a little while, but gradually sank during the evening, and died early in the morning of the 18th. No oxygen was used after the night of 45.
of the 16th, as it ceased to give any relief.

CASE VII. Mary C. aet. 5½. Has been cyanosed from birth. Within the last few weeks cyanosis has increased, and she constantly feels wearied and short of breath on the least exertion. Cannot walk more than three or four yards without being fatigued. She is a well formed, intelligent child, though rather small for her age. The ordinary phenomena of congenital heart disease are strongly marked, e.g. blueness of lips, mucus membranes, &c., Fingers and toes are markedly clubbed, and nails are commencing to curve. Distended venous radicles are visible on the phalanges, giving an appearance of enlargement of the inter-phalangeal articulations. Pulse 134, regular and small. Resp. 30.

On examining chest a slight pulsation is visible in episternal notch. Apex beat not visible; can be palpated almost in line of nipple, fifth intercostal space. No thrill. Deep cardiac dulness does not extend to the right beyond the middle of the sternum. On auscultation, a soft blowing murmur replaces the first sound, all over the precordial region. Heard loudest in pulmonary area. Second sound a little accentuated. Murmur is audible, more or less, all over front of chest.

This patient was allowed to inhale oxygen for a period of half an hour. The method adopted was simply to allow her to hold in her mouth, a tube through which a stream of oxygen flowed. No visible change
occurred in her condition.

CASE VIII. Betsy A. T. aet. 43. Married. Multipara. Housewife. Was first seen December 22nd. 1892. Had been sickly and out of sorts for some time, and three weeks previously, a slight degree of jaundice appeared, which however, did not become intense. She continued to do her ordinary work, though with difficulty. Suffered from nausea, but no vomiting or purging. She thought her illness was due to commencement of menopause. On December 22nd. she was sitting in a chair complaining of dragging pains about the hips, slight nausea, and a feeling of weakness. She seemed in rather a stolid frame of mind, and particulars of her illness could hardly be extracted. Was never a woman of very great intelligence. There was a slight degree of jaundice, most visible in the eye balls. Tongue was dry, and coated with a yellow fur. Pulse 140, small and weak. Temp. 100°. Was sent to bed.

On December 23rd. the additional information was obtained from her neighbours, that she had been gradually losing flesh for some time, and there can be no doubt she had been a secret drinker. She had suffered from morning sickness for many months. Vomited matters were chiefly clear mucus, and never contained blood.

The following notes were taken:-

Restless during the night. Very prostrate to day. Temp 101°. Pulse 140, small, regular, feeble, soft. artery wall a little thickened, but not tortucus.

Abdomen. Rather protuberant. No tenderness. No abnormality detected by palpation. Liver dulness of normal extent, not decreased. Edge of liver can be palpated, and is felt to be smooth and not hard.

Spleen normal, no ascites. A few pin-head sized spots of haemorrhage found about lower part of abdomen, both thighs, and both legs. No tenderness or distention in right iliac fossa. No gurgling.

Per vaginam, uterus unimpregnated. Normal as to size and position. Lungs, healthy. Heart sounds both rather feeble, with a tendency to reduplication. Apex beat in normal situation. Cardiac dulness not increased.

Urinates and defaecates naturally. Urine rather scanty, perfectly clear, slightly tinged with bile pigment. No deposit on standing. No leucin or tyrosin on evaporating a few drops on a slide. No albumen or sugar.

Motions are rather diarrhoeic, small, porridgy, of a pale golden yellow colour.

Seems rather apathetic and disinclined to talk. Answers questions with intelligence, though unwillingly. Talked a little incoherently during the night. Jaundice has not increased since yesterday.
December 24th. Passed a restless night, and was inclined to ramble. Is quite collected this morning, but has a difficulty in speaking much, on account of dyspnoea. Tongue very dry, brown, furred. Sordes about lips and teeth. Jaundice has not increased. Urine as yesterday. No fresh petechiae. Pulse 140. Resp. 40. Temp. 100°.

December 25th. Very restless during night, and slightly delirious. Was kept in bed with some difficulty. Thought she saw mice and rats running about the room. Is able to answer questions, but talks rather at random. Strongly resents attempts at physical examination, and there seems to be a tendency to rigidity of limbs. Slight subsultus noticed in wrists. Very prostrate. Pulse 145. Resp. 40. Temp. 98°.

December 26th. Pulse 150. Almost galloping, and very feeble. Resp. 45. Is slightly cyanosed, and jaundice apparently not quite so marked. Very delirious all night. Does not recognise her friends, and imagines she sees quantities of faces moving about her room. Is inclined to keep constantly muttering to herself. Pupils have up to this time been equal, not contracted and have reacted normally. They are now found to react to light rather sluggishly.

All motions and urine passed in bed. Marked subsultus. Sleeps with eyes partially open. Eyelids are constantly in a state of tremor. Jaws rigid, and tongue only partially inspected. Much sordes of almost a black colour about teeth and lips.
December 27th. Pulse 150. Resp. 45. Thermometer (in vagina) will not rise above 96°. Has been in a state of muttering delirium all night. No change in physical signs. Pupils equal, a little contracted, and react very sluggishly to light. Swallows with great difficulty. Can scarcely be roused to answer questions. When roughly handled utters incoherent cries of displeasure. Limbs very rigid. Superficial and deep reflexes cannot be elicited. Marked subsultus, and picking at bed clothes. Constant twitchings of muscles of face and eyes. Respiration noisy.


The patient was obviously moribund, and, as a last resource, oxygen was tried at 2 p.m. A free stream was caused to flow from the end of a tube, placed close to her mouth and nostrils. She must have breathed a highly oxygenated atmosphere. Her colour almost immediately improved. Respiration became less laboured and slower. In the evening the improvement was maintained, but during the night her prostration became 50.
still greater. She lived, however, till 11-15 a.m. on the 29th.

Her motions remained of the same character throughout - small, frequent, and of a pale, golden yellow colour. Since the 23rd. no urine could be obtained.

Before oxygen was commenced, the treatment had consisted in a purgative dose of Epsom salts, cardiac tonics, (digitalis and stropanthus,) and stimulants.

CASE IX. Emily K. aet. 10 months. Was noticed on February 21st. at about 5-30 p.m. to look a little peculiar, and apparently she had, at that time a slight convolution. Had been fretful and ailing for several days, coughing a little, and feverish at times. Had always been a remarkably healthy child. On examination she was noticed to be very flushed, and obviously agitated. There was a slight degree of bronchitis, and it was thought that a measles rash could be detected, making its appearance on the cheeks in front of the ears, and forehead. (A very violent epidemic of measles was prevalent at the time, though, as far as could be ascertained, the child had not been exposed to infection). There was no coryza, and no redness of the conjunctiva.

At 7, and again at 8 p.m., an undoubted severe general convolution occurred. All four limbs, face, and eyes, were strongly affected, and after the attack had passed away, the child lay in a stupefied state breathing rapidly and noisily, through its widely opened mouth, and dilated nostrils.
After 8 p.m. the convulsions succeeded each other almost without pause. The child gradually became asphyxiated. The pulse rate rose, till at length it was no longer countable. Respiration became more and more hurried, and accompanied by noisy mucous rattlings. At 8-30 p.m. Temp. was 103.4°, and the pupils strongly contracted. At about 9-30, the child’s strength was exhausted, and she died in a state of complete coma.

From 8-30 p.m. till shortly before death occurred, a stream of oxygen was allowed to flow over her face, but it had no apparent effect in diminishing the cyanosis or coma. Before 8-30 p.m. the treatment consisted in a hot bath followed by a hot wet pack, cold to the head, a dose of bromide of potassium, and shortly after 8 p.m. inhalation of chloroform for about 20 minutes.

The oxygen was used as a last resource, when death seemed imminent from asphyxia.

CASE X. John S.A. Manufacturing Chemist. Has suffered from glycosuria for many years. Sugar was first discovered in his urine 7 or 8 years ago, but there can be little doubt, that it had been present for a much longer period.

His symptoms have never been very acute, and have consisted, chiefly, of a feeling of general malaise, excessive sweating, and vague pains, referred to the head, trunk, and limbs.
His urine has never been very large in amount, rarely exceeding 3 pints in 24 hours, has never contained albumen, and has not invariably contained sugar. Its Spec. Grav. has varied, on different examinations, from 1002 to 1035, or even higher. It has been acid in reaction, and often deposited a sediment of mucus and uric acid.

His weight was varied very little for two or three years. He is a short, stout man, of rather sedentary habits, spending much of his time in-doors.

A strict dietetic treatment, tried about a year ago, had very little effect on the sugar excretion, and much aggravated his dyspeptic symptoms, which have always given him a good deal of annoyance.

Some observations were made during April and May, 1892, on the influence of oxygen inhalations on the amount of sugar excreted. His diet during that period consisted of bread, butter, eggs, bacon, broths, poultry, fish, beef and mutton, cabbage, cauliflower, Brussels sprouts, milk puddings, (rice and sago), porridge; for beverages he used lime-water, milk, and soda water. He avoided tea and coffee, potatoes and sugar, because he found they were apt to cause acidity and flatulence. The actual quantity of food he took each day was not ascertained, but it probably varied very little, as he was very precise in his habits.

The urine was collected from 6 p.m. to 6 p.m. and every care taken, as far as possible, to avoid sources of fallacy. The sugar was estimated by means of
Fehling’s solution.

The oxygen was inhaled in two doses, morning and evening, from an india-rubber bag.

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<tr>
<th>DATE</th>
<th>AMOUNT</th>
<th>SUGAR</th>
<th>OXYGEN</th>
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<tbody>
<tr>
<td>April 25th.</td>
<td>60 oz.</td>
<td>122.4 grammes</td>
<td>None.</td>
</tr>
<tr>
<td>&quot; 26th.</td>
<td>60 &quot;</td>
<td>107.1 &quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>&quot; 27th.</td>
<td>60 &quot;</td>
<td>142.1 &quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>&quot; 28th.</td>
<td>45 &quot;</td>
<td>107.7 &quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>&quot; 29th.</td>
<td>50 &quot;</td>
<td>119.04 &quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>&quot; 30th.</td>
<td>55 &quot;</td>
<td>130.9 &quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>May 1st.</td>
<td>60 &quot;</td>
<td>171.4 &quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>&quot; 2nd.</td>
<td>50 &quot;</td>
<td>120.2 &quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>&quot; 3rd.</td>
<td>50 &quot;</td>
<td>142.8 &quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>&quot; 4th.</td>
<td>55 &quot;</td>
<td>131. &quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>&quot; 5th.</td>
<td>52. &quot;</td>
<td>123.7 &quot;</td>
<td>2 gallons.</td>
</tr>
<tr>
<td>&quot; 6th.</td>
<td>50 &quot;</td>
<td>142 &quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>&quot; 7th.</td>
<td>56 &quot;</td>
<td>133.3 &quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>&quot; 8th.</td>
<td>50 &quot;</td>
<td>120 &quot;</td>
<td>6 gallons.</td>
</tr>
<tr>
<td>&quot; 9th.</td>
<td>40 &quot;</td>
<td>63.4 &quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>&quot; 10th.</td>
<td>40 &quot;</td>
<td>95.5 &quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>&quot; 11th.</td>
<td>33 &quot;</td>
<td>58.2 &quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>&quot; 12th.</td>
<td>40 &quot;</td>
<td>71.4 &quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>&quot; 13th.</td>
<td>45 &quot;</td>
<td>91.8 &quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>&quot; 14th.</td>
<td>42 &quot;</td>
<td>100.1 &quot;</td>
<td>3 gallons.</td>
</tr>
<tr>
<td>&quot; 15th.</td>
<td>46 &quot;</td>
<td>109.5 &quot;</td>
<td>none.</td>
</tr>
<tr>
<td>&quot; 16th.</td>
<td>42 &quot;</td>
<td>126.6 &quot;</td>
<td>&quot;</td>
</tr>
</tbody>
</table>
The results are given with some diffidence and must simply be taken for what they are worth. Certainly they show a very decided decrease, both in the amount of the urine, and the quantity of sugar excreted; but it is quite possible that one of the periods of remission, which seem to occur in cases of this kind, chanced to coincide with the period of treatment.

The patient thought that his general symptoms were alleviated, and that he felt stronger and slept better.

Unfortunately, time did not permit of a further series of observations.

The writer has tried the effect of oxygen applied locally to granulating wounds, but never observed any of the effects described by some authorities. He only noticed a slight drying of the surface.

--- CONCLUDING REMARKS. ---

In conclusion, the writer is bound to confess, that, in his hands, the use of oxygen, has been of little avail. Truly enough, he chiefly employed it as a last resource, in cases of such gravity, that a recovery would have been little short of miraculous. Still, the good effects observed, were of so evanescent and temporary a character, that, (with one slight omission)
he feels inclined to re-echo the words of Pareira, "It is remarkable that electricity and oxygen, two agents of vast importance in nature, should possess but slight remedial powers".

NOTE. The oxygen used was that supplied by the Manchester Oxygen Co., (Brin's patent).
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(LEBLOND. of St. Lazare Hospital) "Treatment of Diabetes". Printed by Armitage & Ibbetson. Bradford, 1887.


The Case
Radcliffe
M. Marchesi

Dear Sir,

Herned I send in my prayer a list of certificates which I shall be much obliged if you will send. I also let me know of everything in paper
I had the honor of receiving a note from the subject in London, (The Mathematical Society) wherein I shared his esteem at the end of my second year. I am sorry to need your aid in this matter. Can you confirm this?

Believe me,

Very sincerely yours,

Arthur letters

April 25th, 1873.
I hereby declare under the 
Thrice " A the Value of Bye - 
8s in the Treatment of Disease 
has been conducted by myself 
 Arthur Ellis 

25th April 1873.
Bank House
Angeliffe Lane.
April 25th - 1893

I certify that Arthur Sellers
has been engaged in general
medical hospital practice
during the last four years.

Wm. Sellers £.
M.D. Lond.