is hardly necessary to refer to the common household practice of putting the feet into hot water just before going to bed, to induce general perspiration, and so relieve catarrh. The hot foot-bath or the sitz-bath is of great service when the menstrual flow is either deficient or absent. To this bath mustard may be added with advantage; but, as the late Dr. Graves insisted, it should be used only at the menstrual period. This mustard bath employed nightly, or night and morning, for six days, commencing one or two days before the period begins, is a very useful auxiliary to other treatment, and often succeeds in establishing menstruation. This sitz-bath is often effectual, when sometimes, from exposure to cold or from other circumstances, this flow is suddenly stopped, to the patient's great annoyance and suffering.

Dr. Druitt points out that by sponging the body with very hot water, the excessive perspiration of phthisis may be diminished for some hours.

Hot water to the legs and feet often removes headache, and according to Dr. Graves, relieves distressing palpitation.

Langenbeck asserts, that, after an amputation, if the stump is kept immersed in a warm bath, it will avert pyæmia.

Sponging the face, temples, and neck with water as hot as can be borne, often relieves the headache of influenza, catarrh, and of other diseases.

The *hot-air bath* very often succeeds in promoting free perspiration. If it is highly desirable to establish a free flow of perspiration, the hot-air bath may be preceded by the general warm bath.

Vapour baths are used for the same purpose. Less depressing than the general warm bath, they produce much less elevation of the temperature of the body, which probably explains their difference in this respect.



## PEROXIDE OF HYDROGEN.

Peroxide of Hydrogen has been used both internally and externally. It whitens the skin or mucous membranes, and excites a pricking sensation, and, in delicate structures, as the conjunctiva, a slight amount of inflammation.

According to Dr. Stohr, on adding peroxide to venous blood, pretty active effervescence occurs. The solution soon becomes yellowish red, then pale yellow, and in five or six minutes from the beginning of the experiment, colourless, and afterwards a white flocculent coagulum settles. The corpuscles themselves, when treated with a strong solution, become irregular in outline, and do not form rouleaus. Added to pus, much gas is given off, and the mixture becomes turbid with white flocculi. Many of the corpuscles are shrunken or altogether destroyed.

Applied to abraded surfaces, covered with blood or pus, the solution of peroxide behaves in the manner above described, the surface becoming ultimately covered with a thin layer of coagulated albumen. The solution, it is said, is applied with decided advantage to chancrous sores, healing them in half the ordinary time. The sore is to be washed with the solution three times a day, and to be continuously covered with lint moistened with it. Open buboes have been treated successfully in the same manner. The solution is said to destroy the specific character of a chancrous sore.

Internally, it is reputed to be a disinfectant and slightly stimulant.

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## CARBON. ANIMAL CHARCOAL.
## „ WOOD CHARCOAL.

Carbon, in proportion to its porosity, absorbs many gases in considerable quantity; and wood, being more porous than animal charcoal, its absorbability is greater.

Charcoal does not absorb all gases in an equal degree; for it has little power in this respect over hydrogen, while it absorbs a considerable amount of oxygen, a large quantity of sulphurretted hydrogen, and a still greater proportion of ammonia. Charcoal is much used on account of this property as a disinfectant, to remove bad smells, or to prevent the air in rooms becoming contaminated by the effluvia from foul ulcers. Its non-volatility renders it very inferior to chlorinated lime or chlorine gas for purifying air, since it can act only on the air immediately in contact with it.

It is more effectual in absorbing the offensive gases given off by foul sores, and is generally employed in the form of a poultice, mixed either with bread or linseed-meal. Bread, being more porous is to be preferred, as it permits the gases to permeate the substance of the poultice, and so to come in contact with the particles of charcoal.

It may reasonably be doubted if, after becoming thoroughly moistened and its pores filled with water, the charcoal does not lose its capacity to absorb gases and so to act as a deodorizer. It is certain that charcoal poultices often fail to act in this manner. Charcoal may act by preventing decomposition, for, taken into the stomach after being mixed with water, and its pores filled or obstructed, it still prevents flatulence, an effect not due to absorption; it must therefore act by arresting fermentation or decomposition. A thoroughly efficient mode of employing charcoal, is to fill a small flat muslin bag with it, in a finely granulated form, and to place it over the poultice covering the sore.

Charcoal poultices are reputed to change the condition of sloughing or gangrenous wounds, making them cleaner and more prone to heal. But it is very doubtful if charcoal possesses such a property.

How does charcoal destroy smells depending on noxious gases? It has been stated in a previous page that it is endowed with the property of condensing many gases in its pores, and some accept this property as a sufficient explanation of its action. Others assert that the oxygen condensed



and accumulated in the pores of the charcoal, combining with the other gases with which it comes in contact, breaks them up and destroys their ill odour.

Of more practical importance is the question whether the carbon becomes inert by use, thus losing its property to condense gases or to destroy them. Buchheim is probably right in stating that the carbon becomes inert, but others assert that if kept dry, it retains its properties unimpaired for many years: at all events exposure to a dull red heat restores its gas-absorbing power.

Charcoal is likewise employed as a disinfectant, and Dr. Stenhouse has devised a charcoal disinfecting respirator, which, no doubt, is protective against many gases, but at present no evidence exists to show that charcoal will destroy the organic matters which propagate disease, although acting like a filter it may prevent their entering the system.

Charcoal, by its chemical or mechanical action, possesses the property of carrying down from solutions many colouring matters, many bitter substances, alkaloids, and mineral substances. Hence Dr. Garrod advises its administration in poisoning by corrosive sublimate, arsenic, morphia, strychnia, belladonna, etc., but at present this treatment of poisoning has not found much favour with the profession. Charcoal also precipitates the colouring matter of urine, carrying down at the same time all the uric acid, and some of the urea in solution. The sugar of diabetic urine is unaffected by charcoal. As a precipitant of the above named substances, animal charcoal freed from it earthly impurities is found to be the most efficacious, on account, it is said, of its more finely divided state.

Charcoal is employed with much success in some diseases of the stomach. It is said to ease the pain in chronic ulcer, and of neuralgia of the stomach. It is markedly useful in flatulence. In the majority, if not in all cases, intestinal flatulence is the result of gases generated by fermentation. The symptoms accompanying flatulence, however, are not always alike, and their various combinations afford indications for

treatment. Sometimes "the wind" is produced in enormous quantities, with great rapidity, producing distension, eructation, and mental depression; the patient complaining only of these symptoms; not of pain nor of acidity. This enormous production of wind, irrespective of other symptoms, prevails chiefly among middle-aged women, especially at the change of life. Sometimes during pregnancy and suckling, and seldomer in the course of phthisis, this condition is met with. It is often very difficult to check the formation of wind, but vegetable charcoal is one of the best remedies for this purpose. Sometimes after a few mouthfuls of food the wind is formed in a quantity so large that the patient is constrained to cease eating: here the charcoal should be taken immediately before each meal. Another patient is not troubled with the wind till half an hour or longer after food: here the charcoal should be taken soon after the meal. Five or ten grains of charcoal is generally enough, and if this dose fail, it seldom happens that a larger one succeeds. Supposing charcoal to fail in cases like these just described, we have another efficient resource in the sulpho-carbolates or carbolic acid.

At other times profuse formation of wind is accompained by acidity. Charcoal, administered as above described, will generally obviate both these symptoms; and sulpho-carbolates and carbolic acid, although less successful than when acidity is absent, will often prevent the production of both wind and acidity.

Some persons after meals are troubled with a little wind, acidity, and a sensation of weight at the pit of the stomach. Charcoal will relieve these cases; but nux vomica, in five-minim doses of the tincture, taken a few minutes before meals, is to be preferred. In the treatment of flatulence it must never be forgotten to direct the patient, as far as possible, to abstain from those kinds of food prone to fermentation. Sugar and starchy foods must be avoided or sparingly eaten, and thin well-browned toast, on account of the carbonization of its surface, may be substituted for bread. The meals should be very moderate, the food well masticated, and drinking postponed till the meal is nearly finished, or still better, till an hour after its completion. Tea is very obnoxious to flatulent patients.



Most of the charcoal passes away with the fœces; a little, it is stated, finds its way into the blood aud lymphatics.

For internal use, wood is preferred to animal charcoal. It is often advantageously mixed with equal quantities of bismuth, when flatulence is combined with acidity and pain.

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## CARBONIC ACID GAS.

It is asserted that this gas applied to the eye relieves the pain and photophobia of scrofulous ophthalmia, and that injected up the vagina it eases the pain of ulceration of the os uteri and of cancer and neuralgia of the uterus. According to Sir J. Simpson, the inhalation of this gas benefits in chronic bronchitis, asthma, and irritable cough.

Carbonic acid gas is generally employed dissolved in water. Natural waters containing a large quantity of carbonic acid are used externally in chronic gout, chronic rheumatism, and many chronic skin affections. Carbonic acid is an excitant of the skin, producing tingling, redness, and a sensation of warmth, increasing the flow of the perspiration, but after a time acting in some measure as an anæsthetic lessening the sensibility of the skin, and removing or diminishing pain.

Carbonic acid water is employed in painful and irritable conditions of the stomach. It eases pain, and checks vomiting. It is an excellent plan to mix it with milk, which often previously rejected, is then generally retained. Then lime water may profitably be substituted for carbonic acid water in diarrhœa with irritability of the stomach; but with constipation carbonic acid water is much to be preferred.

## NITROUS OXIDE GAS.

Of late this gas has been extensively used as an anæsthetic. To Mr. Clover, the highest English authority on all matters pertaining to the administration of anæsthetics, the author is indebted for the following remarks:—

**Preparation.**—Nitrous oxide is made by boiling nitrate of ammonia in a glass retort. The gas and steam thus formed are passed through water to remove any of the higher oxides of nitrogen, and the gas collected in a gasometer.

Nitrous oxide is now prepared on a large scale, and condensed in iron bottles. It is sold in the liquid form by Messrs. Coxeter, and by Barth and Co. The contents of the bottle are easily measured by weighing. A gallon weighs about three-tenths of an ounce.

**Effects on Animals.**—Dogs and cats obliged to breathe the pure gas are killed in a few minutes; after making the usual efforts to get free they become insensible, make slight convulsive movements, and then breathe stertorously. The breathing always intermits before the heart's action fails. If the animal is brought into pure air when the intervals of breathing are not more than thirty seconds, it always recovers. The recovery is attended with panting respiration.

**Administration.**—In producing anæsthesia by nitrous oxide, it should be remembered that it is to be given pure, and without any admixture of air. The time required to fit the patient for the operation is to be reckoned, not from the commencement of inhalation, but rather from the time when the lungs are finally deprived of all atmospheric air, after which I believe that every patient is ready for the operation in a very few seconds. The gas may be conveyed by an inch tube either from the gas-holder or from an air-proof bag, holding not less than two cubic feet of gas. If the compressed or liquid gas be used, it must first be conducted from the iron vessel into an air-proof bag. Care must be taken not to allow the liquid gas to escape so rapidly as to produce cold



enough to freeze the gas, and so for a time to stop the supply. The mouth-piece may be made so as to be held between the teeth; but this plan necessitates the pinching the patient's nostrils and compressing his lips against the tube, which is objectionable. In spite of this a restless patient will sometimes draw in a little fresh air, which will keep him for the next half-minute either conscious or in such a state that he will struggle against the operation.

I find the apparatus which I have used for several years for giving 4 per cent. of the vapour of chloroform answer equally well for giving nitrous oxide. With the view of overcoming the liability of air to get accidentally under the mouth-piece during forced respiration, and for economising the quantity of gas used, I have added to the mouth-piece a supplemental bag, holding about two hundred cubic inches, connected to the mouth-piece by a three-quarter inch tube and stop-cock. A portion of the expired gas escapes through the expiring valve, and during inspiration the gas is supplied partly fresh from the larger bag, and partly from the supplemental bag. It answers the same purpose, and it is more convenient, to place a lever under the inspiring valve, so that the action of the latter can be stopped. Having applied the face-piece, the patient should be directed to inhale *freely* rather than rapidly, and to empty his chest at each expiration, so that he may get rid as speedily as possible of the residual air in his lungs. Pure gas is so free from taste and smell that it is very readily respired; he should be told that he will hear ringing sounds, and experience a sense of general pulsation, but that he has only to continue breathing freely to procure the wished-for sleep. After four or five respirations the stop-cock of the supplemental bag, which has hitherto been kept empty, should be opened to receive a portion of the expired gas, and again supply it at the next inspiration. If there is no supplemental bag, the lever just mentioned should be pressed upon. The apparatus of Mr. A. Coleman is for the purpose of purifying the expired gas from carbonic acid; it consists of a metallic vessel containing half a pound of slaked lime,

and placed on a table near the patient. This vessel is connected on one side with the gas bag, and on the other, by means of a tube two feet in length, with the face-piece. It is not provided with any valve, so that the bag should be gently pressed during the first four respirations; and after this the expiring valve is fastened down, so that there may be no loss of gas afterwards; I do not think it possesses any practical advantages. Lividity of the face is soon observed; this is not a sign of insensibility, and may be disregarded; the eye soon becomes fixed, and if the conjunctiva is touched, the eyelids contract feebly or not at all; the pupil at this stage is of its normal size. Pinching the skin will now produce no signs of pain; a single tooth, not firmly fixed, may be removed, and such small operations as do not prevent the continuance of the inhalation may be commenced; but it is necessary for enabling the operation to be continued for more than a few seconds without raising the patient to a struggling condition, that other symptoms should be produced. Convulsive twitching of the hands and oscillations of the eyeball next occur, and at the same time, or soon after, the respirations become slower, and are accompanied with a snoring noise. If breathing should cease for fifteen seconds, the chest and abdomen should be pressed upon two or three times. The pulse should always be carefully watched during this part of the administration, lest syncope should occur, in which case the patient should be placed in a horizontal position, and be freely supplied with fresh air. The pulse remaining regular, and the pupil being only moderately dilated, the gas may be continued notwithstanding the convulsions mentioned, and although the breathing begin to be slow; but if the pupil dilate widely, or if the breathing intermit, the gas should be immediately withdrawn. It is astonishing to witness the degree of resuscitation afforded by a single full inspiration of air, so that if it is intended to keep up the anæsthesia, not more than one full inspiration of air should be allowed if the pulse continue distinct. Gas should be given for five or six respirations, and be again intermitted. In dental operations,



on account of the mouth being open, the anæsthesia can be sustained for a limited time only. I have sometimes prolonged it by continuing to supply gas through the nostrils by means of a cap fitting closely over the nose, or by means of a tube held in the mouth; but in most cases the operator has time to extract several teeth before consciousness recurs, and it will generally be found to be the best plan to allow the patient, after one or more teeth have been removed, to awake sufficiently to be able to rinse the mouth, and then to give the gas again. A piece of wood should be placed between the jaws to keep them open, and it should have a string attached to prevent its slipping down the throat. An instrument made of vulcanite and in shape like a small telescope, with a spiral spring inside, is better, as it will retain its position even if the patient try to talk. The piece of string should be attached to the middle part of this instrument and not to the small cap screwed on at each end, in case the cap should become loose. In consequence of this accident having occurred, I have contrived an improved form of this gag, consisting of only two pieces of vulcanite, which are fastened together by a double piece of silk so that they cannot separate in being used. Most patients are glad to inhale again and again. Many persons find the sensation experienced very agreeable; some appear to suffer as from nightmare; it is very rare to have any complaint made of headache. Some persons suffering from headache have awaked from the sleep of nitrous oxide without any. It is doubtful if vomiting ever occurs from a single inhalation of nitrous oxide; but when blood has been swallowed, sickness of short duration has been produced. Such vomiting and prostration as we witness after chloroform and ether is unknown. As previously stated, there is nothing unpleasant in the smell or taste of this gas; indeed, it is hardly to be distinguished from common air, when absolutely pure; but some patients from timidity resist breathing, and so produce a sensation of tightness in the chest. Hysterical patients, when only half under the influence of the gas, are liable to have an attack of hysteria, but it is of short duration,

and most of such cases may safely be left to themselves. These subjects may present threatening symptoms when they cease breathing. In a case of this kind a patient is said to have ceased to breathe for two minutes. She had not taken enough gas to prevent her struggling against the dentist, and was either faint from the violent efforts she had made, or else was just conscious that the medical men were nervous about her, and was actuated by the desire of being an object of interest, so common in patients of this class. She had held her breath, or taken it so very softly as to seem not to breathe at all. The fact that the colour of the lips had improved, and that the pulse had rallied, and was going on with regularity, were signs that the nitrous oxide had nearly left the system. The laughing and gesticulation formerly witnessed in experiments with laughing gas is now seldom seen; and when it happens to occur, we can generally account for it by the patient not having inhaled gas sufficiently pure. It was then given by means of a bladder and small tube, through which the patient breathed backward and forward; the gas would thus be diluted with some eighty cubic inches or more of residual air in the lungs, and a further dilution would be likely to occur through an involuntary or voluntary effort on the patient's part to obtain air.

I have on many occasions availed myself of nitrous oxide as a preliminary to the administration of ether or chloroform.

Some persons have a great repugnance to the taste of these agents, and put themselves to much distress in holding their breath to avoid it. Five or six respirations of gas are sufficient to blunt the sensibility of the air passages and enable the patient to respire freely. The after effects of ether or chloroform, as might be expected, remain the same. The administrators should know that if panting respiration occur (as it often does when after inhaling gas the patient begins to breathe air) it is not safe to give these anæsthetics as freely as in ordinary breathing.

Those persons who are frequently engaged in giving anæsthetics will find it useful to have an arrangement of their apparatus, by which on turning a stop-cock the supply of gas is made to pass through a chamber containing ether, and having a water jacket to keep up the temperature of the ether. This is especially of use for prolonged dental operations, as the anæsthesia is by its means easily kept up for two minutes. Of course the patient should be carefully watched for signs of failing heart, or failing respiration, as the resuscitation would be impeded by the amount of narcotic vapour in the chest.



**Physiological Action.**—It appears to produce its anæsthetic effects by preventing the oxidation of the nervous centres, and this chiefly by depriving the blood of its supply of free oxygen. Although there is more oxygen in nitrous oxide than in air, it is chemically combined with nitrogen, whereas air is a mixture of nitrogen with free oxygen. The effect of a moderate quantity of nitrous oxide, so long as the influence of the atmospheric air last inhaled remains, is exciting; but as soon as the oxygenating property of the blood is lost, the functions of the nervous system fail, and if fresh air be not quickly supplied, they cease, and the animal dies.

But although the inhalation of this gas deprives the blood of oxygen in an available form, it does not prevent the escape of carbonic acid; for if the expired gas is passed over lime water, or over hydrate of lime, as in Mr. Coleman's apparatus, the lime is found to have taken it up, and to be converted into carbonate of lime. A further confirmation of this is afforded in contrasting the effect of inhaling the same gas again and again from a bladder of small size. In this case the anæsthesia approaches slowly, is accompanied by excitement, and there is more or less headache complained of afterwards, which rarely or never occurs from breathing pure nitrous oxide.

The functions of the brain proper cease before those of the medulla oblongata, hence we have loss of consciousness before the respiration fails; and the functions of the medulla are abolished before those of the ganglia presiding over the

heart, and hence failing respiration occurs before failure of the heart's action.

Only one death is known to have occurred within an hour of inhaling the gas. This case was one of extensive phthisis, and it has been supposed from this case, and from the lividity induced by the gas, that persons with delicate lungs are not fit subjects for taking it. If extensive disease of the lung exists, it would be imprudent to use it in the present state of our knowledge; but I have given it where I have believed only a moderate lung disease existed, and observed that in these cases no untoward symptoms were produced. Persons liable to syncope would seem to be unfit subjects, but many such patients have taken the gas without serious consequences having occurred.

I have known no signs of mischief to the brain follow the inhalation. I have given it successfully to several persons who were the subjects of epilepsy.

Pregnancy is not a bar to its use; but in such cases it should be given with caution.

The danger of death from blood getting into the trachea would be as great, or greater, than when chloroform is given. The patient would unfortunately show no signs of it, as the lividity which *might* tell of it would, of course, not be distinguishable from that of nitrous oxide.

From all that I have seen of the administration of anæsthetics, and from the accounts published of the cases where they have been followed by a fatal result, it appears to me of little importance what is the age, temperament, or disease of the patient, in estimating the danger of using them. The young and old, feeble and strong, fat and thin subjects, have all on some few occasions died from them. On the other hand, we have witnessed the successful administration of chloroform, etc., in the advanced state of phthisis, heart disease, etc. The only reasonable hope of security lies in carefully preventing an overpowering dose, or the prolonged exhibition of a milder one, after symptoms of failing lungs or heart have shown themselves.



## SULPHUR.

Sulphur dusted on the skin produces no effect on it, but mixed with lard or other unctuous substances, and rubbed in, it excites a slight degree of inflammation, on which account sulphur ointment has been applied to indolent sores to stimulate them to a healthier and more healing condition; but more efficient ointments for such a purpose have superseded sulphur ointment, which is now almost entirely restricted to the cure of itch. The object is to destroy the insect (*acarus scabiei*) and its ova, for it is on the presence of this animal that itch depends. A knowledge of their habits suggests the means best calculated to destroy them. The female, as soon as impregnated, burrows obliquely under the skin, and day by day deposits her eggs till she dies. The male remains a wanderer on the surface, and is easily attacked and killed by the ointment. To reach and destroy a female and her eggs, it is necessary to break up the burrows where these lie concealed, and to lay them bare to the action of the sulphur ointment. The destruction of the burrows is easily effected by the liberal use of soap and water, which removes the superficial and dead cuticle, and exposes the animal and its ova.

Various methods of sulphur treatment are in use, but it is sufficient here to record only a few.

M. Hardy claims that his method will cure in four hours. He first orders the body to be subjected for half an hour to a friction of soft soap, which cleanses the skin and lays bare the burrows. Then follows a warm bath of an hour's duration, during which the skin is well rubbed to complete the destruction of the burrows. Then the skin is well rubbed all over, except the head and face, unless in the rare instances when these parts are attacked, with an ointment composed of two parts of sulphur, one of carbonate of potash, and eight of lard. One such course effects a cure.

This rather severe method not unfrequently irritates, in-