THE SOLAR ECLIPSE.

By J. A. HINGESTON, Esq., Brighton.

THE variations of health and disease in relation to light, heat, electricity, and the magnetic force, is a subject that is every day acquiring fresh interest, from the investigation of their several phenomena. Meteorology is no longer a science apart from hygienic considerations of the utmost importance. The value of daylight is at last receiving its proper attention in the statistical reports of the public health. Electricity, not many years ago looked upon as a recondite matter of philosophical theory and experiment, is at length regarded as one of the chief agents of vitality. Even magnetism takes its place among the intricate actions of life; for some observers think that they have good reason for concluding, that the greater or less intensity of the oscillations of the needle is in correspondence with certain pathological changes and morbid conditions of the air. These are facts or doctrines of the highest significance. Their indications are invaluable; and time alone is wanting to verify, correct, or cancel them as data, by which we may either act or reason. The solar eclipse offered a rare opportunity for observing them all upon a grand scale; and as such, I have drawn up a statement of all the information I could gather on this point, and have reduced it into as condensed a form as possible, for the purpose of present inquiry and future reference and research.

Meteorological Observations for March 15th.

1858.	Hour.	Amount of daylight.	Hygro- meter.	Electro- meter.	Thermometer.		Baro- meter.	Sky, Wind N.W.
					Night.	Shade.		
March 15	9	3—4	80	act. pos.	37	47	29.720	fair morn.
"	10	4—5	"	act. neg.		48	29.728	light clouds.
"	11	3—4	"	act. pos.		49	29.748	hazy.
"	12	2—3	70	wk. pos.		51	29.750	hazy clouds.
"	12.30	1—2	"	act. pos.		49	29.766	grey clouds.
"	1.10	1—2	80	nil.		47	29.760	dark clouds.
"	2	2—3	"	act. pos.		48	29.774	overcast.

200 feet above the sea-level. The assumed maximum of daylight is 8.

The foregoing observations are entirely meteorological, and such as could be accurately taken without the aid of astronomical instruments. They describe the condition of the atmosphere, the amount of clouds, the degree of daylight, moisture, barometrical pressure, and thermometrical temperature (Fah.), as well as the kind of electricity, from nine o'clock A.M., till two o'clock P.M. The several instruments employed are of approved character, and such as I have been in the habit of using for a long time past. They can, therefore, be perfectly relied upon. The amount of daylight was never less than that of a grey evening in November. At the darkest moment, there was nothing particularly unpleasant in the twilight; and I was able to read off the gradient of my barometer (which is under cover, in a room with a northern aspect) throughout the whole

of the time. The birds did not go to roost; for the sparrows were chirping, and some pigeons were flying about, during the darkest period of the eclipse. Perhaps, if the public had not been alive to its occurrence, the darkness might have passed by without its being particularly noticed by any one, except as a dark hour or so, more than usual. Owing to the overcast sky, the stars were, of course, invisible; but it is doubtful whether they could have been seen, even had the sky been clear, at the maximum of the occultation.

I had strong reasons for supposing that both the magnet and the daylight would exhibit some peculiar phenomena; and, from the authentic reports of others, it appears that the magnet was considerably disturbed and deviated from its true meridian, and that the daylight was polarised at the extreme moment of obscuration. At 1.10 o'clock P.M., I found the electricity *nil*; I had no doubt that the light was completely polarised; and it now appears that the magnet lost its true meridian. If this were actually the case, then it may be concluded that the magnetic force, the atmospheric electricity, and the solar beam, were extinct at the centre of the eclipse. So that the electro-magnetic agency that sustains the material world, and the sun's ray that vivifies the animal and vegetable creations, were, *pro tanto*, extinct together at that critical moment; which, had it been prolonged, would have finally extinguished the present order of nature, and brought both animal and vegetable existences to their close.

On further inquiry, I learn that the ozone—the presence of which in the atmosphere is at all times uncertain—was, on this day in particular, reduced to zero, in strict accordance with the transient polarisation of the light and the cessation of the electro-magnetic force. No state of atmosphere could be imagined more insalubrious than that described in this account, which renders the sublime ideal of an eclipse “shedding disastrous twilight on half the nations”, no longer a poetic fiction, but a scientific expression of the truth. Up to the centre of the eclipse, the electricity had been *positive*, and the weather cold; but, subsequently to that point of time, it became *negative*, and the air warm, the electric current being instantly reversed. March has been, as I have ascertained by exact admeasurement, one third darker than it usually is, arising, in all probability, from the greater or less proximity of the moon's shadow to the earth's surface both before and after her passage across the sun's disc. The purple and yellow light, noticed at the darkest moment, was owing to the distant sky being seen far beyond the depth of the obscuration, showing emphatically that *colour* was absolutely lost at the maximum obscurity; while the sudden return of daylight, so startling to some observers, was nothing more than the restoration of the prismatic elements that had been destroyed as the solar beam was polarised. Nature resumed the order of the day with an electric flash. So that colour, light, electricity, magnetism, ozone, and, of course, heat also, were extinct, or suspended, along the mathematical line traversed by the darkest point, or apex, of the moon's shadow.

ON THE MORTALITY OF INFANTS IN FOUNDLING INSTITUTIONS, AND GENERALLY, AS INFLUENCED BY THE ABSENCE OF BREAST-MILK.

By C. H. F. ROUTH, M.D., Physician to the Samaritan Free Hospital for Women and Children; late Physician to the St. Pancras Royal Dispensary; etc.

PART III.

[Continued from page 288.]

Cows' Milk. This is the substitute for human milk best known in these regions. The absence of odour and its more general diffusion, are advantages in its favour. In appearance, it is of a bluish white colour, almost tasteless, specific gravity varying from 1030 to 1035. Its microscopical characters are about the same as those of human milk, excepting that the milk-globules are more abundant.

Now, it is clear, comparing this with woman's milk, that—1. The quantity of water is less in the cow; 2. The solid matters are in greater quantity; 4. The sugar is less in amount; 5. There is more casein; 6. And more butter; 7. The salts are also in excess.

Analyses of Cow's Milk.

	Simon.			Herberger.		Lecanu.	Boussin- gault.	Chevallier and Henri.	Poggiale (10 cows).	Playfair (9 cows).	Vernois and Bequerel (30 cows).
Water	857	861	823	853.0	862.0	868	874.0	870.2	862.8	—	864.06
Butter	40	38	55	38.9	37.5	36	39.0	31.3	43.8	49.0	36.12
Casein	72	68	67	69.8	67.0	56	34.0	44.8	38.0	41.6	—
Ditto, and extractive matter	—	—	—	—	—	—	—	—	—	—	38.03
Sugar	—	—	—	—	—	—	—	—	52.7	—	55.15
Sugar, and extractive matter	28	29	51	31.3	26.3	40 {	53.0	47.7	—	—	—
Fixed salts	62	61	13	7.0	7.2		—	6.0	—	—	6.64
Earthy salts	—	—	—	—	—	—	2.2	—	2.7	—	—

It is quite manifest that, if the above analyses are to be depended upon, a simple dilution of this milk will not suffice. This may be added to diminish the relative quantity of casein and butter to the normal figure it attains in human milk; but it will only reduce unduly also the amount of sugar; and thus, at the outset, we meet with a difficulty in its employment. But there are other difficulties, more serious and difficult to contend with, and which tend to affect materially its quality. A few of these I will consider *seriatim*. They are—

1. Adulteration of cows' milk.
2. Its acidity dependent upon stall feeding.
3. The effect produced upon the milk by feeding cows in a proper manner.
4. The effect upon milk of keeping cows in unhealthy sheds.

1. *Adulteration.* The most painful part of our experience in towns is, that pure milk cannot be procured; it is almost always adulterated. In the excellent work of Becquerel and Vernois, the *Annales d'Hygiène* (and in this respect Dr. Hassall confirms their results), it appears to be adulterated in Paris by the following substances: water, glucose, flour, starch, dextrine, infusion of amylaceous matters (rice, barley, bran), grumous matters, yolk of egg, and white of egg; sugar, gelatine, liquorice, boiled carrots, broken down calves' brains, serum of blood, several salts, bicarbonate of soda, chalk, turmeric, emulsion of hemp or almond seeds, etc. We do not, however, find that most of these are commonly employed. The adulteration by water is, however, extensively practised in England. Dr. Hassall, out of 26 samples of milk, found that 11 were adulterated with water in the proportions of from 10 to 50 per cent.

Dr. Sanderson, the medical officer of health for Paddington, found in thirty-two specimens of the milk examined by himself and Mr. Alfred Bernays of St. Mary's Hospital, that in all except one, the quantity of water was greater than what it was in pure milk. In many instances (twelve times), the quantity of solid constituents was only half as great as it should be, in a few only one-fourth; many specimens containing less than 6·5 or 5·8 per cent., in a few, gradually diminishing to 3·5 instead of 12·98 as in pure healthy milk.

Dr. Hillier, the medical officer of St. Pancras, examined twenty specimens of milk, and found that the quantity of water added varied from 25 to 50 per cent. That supplied to the work-house was one of the poorest. Instead of a gallon containing nearly 9,000 grains of solid matter, it contained only 5,425 grains, or two thirds the proper quantity. Dr. R. D. Thompson found in Marylebone, that the gallon of milk, in 7 samples, weighed as a mean 71,680 instead of 72,415 grains, which amounts to the withdrawal of 1·44 oz. of solid matter, well calculated to nourish the body, and substituting for it water. Dr. Hyde Salter and Mr. Hunt, from the confessions made to them by milkwomen, their patients, state the quantity of water usually added is one gallon of water to two of milk. What sort of food can this be for an infant, especially if diluted as it almost invariably is by the purchaser, and often afterwards by medical direction? Is it to be wondered at that children fed on such weak milk do not thrive?

2. *Acidity.* Cows' milk, except the animal has been fed upon grass exclusively, is almost always *acid* in stall-fed cows; human milk is always alkaline: hence another reason why cow's milk disagrees with many children.

The experiments of Dr. Mayer of Berlin are particularly conclusive upon this point. He says that for a considerable time he had been in the habit of examining the milk of every

householder in Berlin, and testing it by litmus paper, according as the cows were fed from brewery slops or brandy lees, gardeners' produce, or in the country. In every instance, except one, he had found the milk decidedly sour. a. Of cows fed with brewers' lees, red potatoes, rye bran, and wild hay, in five instances the milk was slightly sour, in one very much so. b. Of forty cows fed with potato mash, barley husk, and clover and barley straw, in ten which were examined, the milk was sour, in three very sour. c. From among fifty cows, fed on potato husks, barley husks, and wild hay, five were examined, and in all the fresh milk was sour. d. From fifty-two cows, fed on potato mash, husks, wild hay, rye straw, out of twelve selected for examination, the fresh milk of all was sour. e. From six cows, fed by a chief gardener on coarse beet-root, red potato, bran mash and hay, the fresh milk was faintly sour. f. From five cows, fed by a cow-feeder on lukewarm bran mash, and hay, in four the fresh milk was quite neutral, in one it was decidedly alkaline. The whole of these experiments were made in the winter season, when cows were necessarily stall-fed, and confirm the truth of the general opinion, that the fresh milk of stall-fed cows is almost invariably acid. Dr. Mayer does not believe that this acidity is due to want of exercise, so much as to the unscientific manner in which the cows are fed; and he particularly objects to the potato mash, which he considers the cause of this acidity. The milk of the cows of gardeners and cow-feeders is usually praised by the Berlin women as being particularly good. But Dr. Mayer has observed that it often gives rise to diarrhoea and cutaneous eruptions in children; which, he supposes, is due to the cows being fed with the cabbage, turnip, and potato refuse. The very worst milk is that supplied by cows fed on potato refuse from brandy distillers, as opposed to that obtained from the cows of cow fatteners, which feed on hay and grass in stalls. By substituting the milk of the latter for the former, he is often enabled to arrest at once the intestinal derangements previously referred to.

3. (a) *Effect upon Cows' Milk of various Kinds of Food.* It must be admitted that a great deal depends upon the manner in which cows are fed. Generally this is done in the cheapest possible way, because milching cows so deteriorate in value after eight or nine months use as such. I am told that a cow purchased for £18 to £20 at the beginning of a season, will sell at a loss of £6 or £8 at the end of it; they look so small and meagre. But this may be easily prevented. A very intelligent gentleman in Nottinghamshire has informed me that if the cows are fed upon a steamed food composed of chopped hay, bran, malt calms and rape-cake, not only will they produce an extra quantity of milk, but keep throughout the milching period in first rate condition; in fact, they will at the end of the six or nine months milk look as well as they ever did.

(b) *Country Milk and Town Milk.* The former is stated to be preferable to the latter. The reason is, no doubt, that the cows are less crowded together, and the milk is less watered.

Becquerel and Vernois have also proved the truth of this popular opinion from their experiments. (The mean figures only are here given.)

	Paris.	Country.
Specific gravity	1033.10	1033.72
Water	869.78	857.80
Solid constituents	130.42	142.20
Butter	33.66	38.85
Casein and extractive matters	53.66	57.00
Sugar	37.07	38.99
Salts	6.03	7.36

This is not, however, due to the mere exposure to country air, because experiments have been made, and when the cows are fed on hay, with oats or barley-straw, the ordinary culinary roots with a certain quantity of wet bran, a similar result is obtained in towns.

(c) *Summer and Winter Milk.* Owing to the difference of nutriment given, the composition of these two milks is not the same. The principal difference observed in winter is a diminution of the water, and among the solid constituents, an increase of the butter only; both the casein and sugar are slightly diminished. In summer there is more water; but what is remarkable is, that among the solid constituents the casein, sugar, and salts are diminished, and the butter is considerably increased.

(d) *Results obtained by various kinds of Food, and Beet-Root in particular.* Dr. Playfair adduces an example of a cow fed on much nitrogenous matter, in which not only was the amount of nitrogenous matter or casein in the milk increased, but also the butter. Certainly the yield of milk is increased by much of that stimulant diet which is occasionally given to cows, such as refuse slop from whiskey distillers, which is known to be given largely in America, and for which cows acquire so depraved an appetite, that they will not take afterwards their ordinary food. (Hassall.) Other less exciting food has the same result. Thus, Parmentier and Deyeux found that cows fed on the leaves and stalks of maize yielded more milk than when fed on ordinary fodder. Moreover, the milk was extremely sweet. The milk obtained from cows fed on potatoes and common grass was much more serous and insipid. That from cows fed on cabbage was much more disagreeable to the taste. Hermanstadt found also that fresh aliments caused a larger quantity of sugar to appear in the milk than dry food.

Among the most approved fodders for cows are sainfoin, Spanish, and ordinary trefoil; but there are a vast number of other annual plants chosen from among the graminaceæ or leguminosæ, which, if cultivated and given to the cows, would prove exceedingly useful. Indeed, Anderson assures us that he had seen cows fed upon trefoil and grass which yielded a superior kind of butter to that afforded by cows fed upon famed old pasture. The ancient faculty of medicine in Paris appointed a commission in 1771 to trace the effects of various roots on the milk of cows. These reported the potato to be particularly useful in increasing the quality and the flow of milk; and that its administration to mothers of thin weakly children had led to the rapid improvement of these latter in every respect.

The effect of several varieties of food is set forth in figures in the following table, compiled from one quoted by Dr. Hassall from Chevallier and Henri, and from another given by Becquerel and Vernois. Chevallier and Henri's cows were fed on ordinary fodder—beet-root and carrots. The winter food of those referred to by Becquerel and Vernois was one bundle and a half of trefoil or lucern, weighing from 12 to 13 pounds; half a bundle of oat-straw to eat, weighing from 9 to 10 pounds; and 25 kilogrammes of beet-root, half in the morning and half at night, with two buckets of water by way of drink. The summer food was green trefoil and lucern, Indian corn, barley, grass, in no fixed quantity, in amount, however, estimated at 45 to 50 kilogrammes. At night, in returning from the field, the cows were given in the stable from 5 to 5 kilogrammes of grass. Drink as in winter.

After Chevallier and Henri.

	Ordinary fodder.	Beet.	Carrots.
Water	876.2	868.8	866.7
Casein	44.8	37.5	42.1
Sugar of milk	31.3	27.5	30.8
Butter.....	47.7	59.5	53.0
Salts	6.0	6.8	7.5

After Vernois and Becquerel.

	Summer food.	Winter food.	Normal Human milk.
Water	859.56	871.26	880.
Casein and extractive matters	54.7	47.81	30.24
Sugar of milk	36.38	33.47	26.66
Butter	42.76	42.07	34.61
Salts	6.80	5.34	1.38

The effect of feeding cows on carrots is slightly to diminish the casein and butter, but to increase the sugar; whereas, if fed on beet-root, both the casein and butter are much more dimin-

ished, and the sugar is much increased. Here, as in the case of the goat, a milk is produced, which, except in the case of the salts, is very like woman's milk.

3. *Effect on Milk of keeping Cows in unhealthy Sheds.* The supply of good and selected food is, however, only one part of the management needed to ensure good milk from milk-bearing animals. Excessive cleanliness should in every way be enforced. Upon the subject of the cleansing of cow-sheds, Messrs. Parmentier and Deyeux remark:—Nothing contributes more to maintain the good quality and quantity of cow's milk than scrupulous cleanliness in the shed. If the faecal matters are left about and removed only at long intervals, the cows lying amid all this mess are always weak; the udders are hot; and the milk, so susceptible of acquiring a bad odour, soon contracts the bad taste, from which it is with difficulty again deprived. The great reputation of the cows of the Prevalaye is due to the remarkable cleanliness in which they are kept, which also enables them to yield an abundance of milk, and to be particularly innocuous to disease.

A very slight glance of what is revealed to us in Dr. Hassall's book as to the unhealthy localities and ill-ventilated sheds in which cows are kept in London, will convince any right thinking man that the cows in such localities cannot be healthy, and that their milk must also prove occasionally very detrimental.

I have, in the course of a large dispensary practice, visited some of the wretched inmates either in the immediate neighbourhood, or living over these sheds. On one occasion I remember having to cross through the shed to get to the small upper room above it to see a child infected with fever. The puddles of liquid and faecal matters through which I was forced to pass, the abominable odour pervading the apartment, I have not yet forgotten; and yet from this cow-shed nearly the whole neighbourhood was supplied.

The character of disease affecting the wretched inmates of the small close cottages just around it was always low, if not typhoid. Many examples are given in Dr. Hassall's book of the wretched, filthy, and offensive sheds in which cows are kept. A common sewer would be in many cases equally serviceable. These facts are well known to most medical and to many general readers of the *Lancet*. I shall, however, content myself with a quotation from the *Lancet*, which retails Dr. Normandy's experience, and from some of the reports of the Officers of Health of later date.

In the Report of the Commission on adulterations (quoted by the *Lancet*, ii, 1855, p. 551), Dr. Normandy states he was lately in the neighbourhood of Clerkenwell for the purpose of examining a well in that locality, when he met with a sight which prevented him from tasting milk for six months afterwards. Dr. Normandy saw from thirty to forty cows in a most disgusting condition, full of ulcers, their teats diseased, and their legs full of tumours and abscesses; in fact, quite horrible to look at; and a fellow was milking them in the midst of all this abomination. This was by no means an exceptional case, a great many dairies being in the same condition. The milk in consequence provided was really diseased milk. This state of the poor animals must have been produced by the manner in which they were kept.

In speaking of cowsheds, Dr. Hillier says of St. Pancras, that there are ninety-two such establishments, some well placed, with good drainage; twenty-two are not near inhabited dwellings; others quite underground; twenty with inhabited rooms above them; some surrounded by noxious exhalations. Their size is often very insufficient; the cubic space for each cow is sometimes as low as 230 feet; 1000 to 1500 being not at all more than cows require. The drainage is very bad in twenty or thirty. Very few are efficiently ventilated; whilst from forty to fifty are as bad as they can be in this respect. Forty of the sheds are kept in a most filthy condition. Seven sheds are without water supply. The manure is kept too long in seventy-six cases; in sixty-three, there is no suitable pit for it; in scarcely any is the place covered over. Occasionally the manure heap is immediately under the windows of dwelling-houses, and in some instances the receptacle for the contents of a privy. The grains on which the cows are fed are usually kept until they are sour, and give out an offensive smell. In seventeen sheds, the cows drank distillers' wash, which is kept in uncovered receptacles, and is very stinking. In addition, there is often vegetable matter lying about the yard, in a rotten state. In fifteen of the sheds, pigs are kept as companions to the cows. Some of the animals are kept very clean, being curried and attended to in the same way as horses. In many instances, on the contrary, they are fearfully neglected,

and their coats are either one entangled mass of filth, or else are free from hair, owing to a diseased state of the skin. The deaths from diseases of cows are enormous. One gentleman, out of a large number, lost in one year ninety; another, who keeps fifty cows, lost three hundred in six years; another, with four hundred to five hundred cows, considers it not bad luck to part with two cows weekly from disease. Insurance prices tell a tale. *Country* dairy cows are insured at sixpence to sevenpence halfpenny in the pound; *London* dairy cows, at eighteen pence to two shillings in the pound; so that they consider the risk on town cows three times as great as on country cows. Dr. Sanderson, medical officer for Paddington, in his report, says the mortality of cows in Paddington was three hundred and four in 1856. In a large proportion, the drainage and ventilation are deficient, and fatal disease has prevailed to a frightful extent among the animals kept. No less than 19 per cent. of the whole number of cows have died in the last three months; in one case, all the cows died.

So much for a few dainty spots in this great town. But is it better in other parts of England, or in other great towns? When diseased cows, many of which are, to use a common term, in consumption, or one mass of ulcers and abscesses, is it wonderful so many children brought up by hand die in towns, while so few comparatively die in the country. No wonder, then, as Dr. Merei says, is it that cows' milk is so depreciated among the working classes. That gentleman states that, of all children fed on other articles besides bread milk (and the number, from another table, appears to be 602 out of 722), only seven, or 1.1 per cent., received cows' milk without bread or other admixture; twenty-seven, or 4.4 per cent., used it with arrow-root or sago, partly with flour.

There can be no doubt, from the general foregoing remarks, that if the subject were more closely studied, cows and goats might be so cared for and so fed as to yield a quality of milk which would be found most serviceable to children brought up by hand. The milk obtained from cows fed upon beet-root, with a very small dilution of water, might be brought so closely to resemble human milk as in all respects to perform the same services. But every day's experience proves that nothing but the most stringent measures can effectually remedy the abuses that prevail. Parliament must interfere: and in what better cause could it do so than by compelling all cowkeepers to sell good milk, to strengthen the bone and sinew of its people, and preserve the lives of thousands of helpless babes? Till this is done, our best efforts, it is feared, will prove nugatory.

[To be continued.]

52, Montagu Square, London, February 1858.

Periscope.

EPIDEMIOLOGY, HYGIENICS, AND STATISTICS.

THE INFLUENCE OF SEWER EMANATIONS.

DR. HERBERT BARKER has lately been making some inquiries as to the influence on the health of animals, of exposure for a long time to air rendered impure by the diffusion through it of emanations from sewers. The full details of these experiments are recorded in the essay "On Malaria," written for the Fothergillian Prize of the Medical Society of London for 1858; but, as the subject has important sanitary bearings, Dr. Barker has published in the *Sanitary Review* for the present month an outline of his researches.

The gaseous emanations from sewers have been subjected, to a certain extent, to chemical analysis. There have been thus detected in them sulphuretted hydrogen gas, sulphide of ammonium, carbonic acid, nitrogen, sometimes phosphuretted hydrogen, and various organic living products. Dr. Odling has recently pointed out the diffusion of an alkaline gas through sewer air.

For the purpose of experiment, Dr. Barker selected a large cesspool, which received, together with the animal excreta, the liquid refuse of an inhabited house. The cesspool was full, and had at all times so bad a smell, that during hot weather the vicinity was scarcely tolerable. The inhabitants of the house, however, had not for many years suffered from any epidemic; nor did the near presence of the sewer seem to affect their general health.

Dr. Barker had built, close by and nearly over this sewer, a small room. Two gutta percha tubes, one inch in diameter, were carried down into the cesspool through its upper wall, and terminated in two large inverted funnels a few inches above the surface of the sewage matter. The other ends of the gutta percha tubes were in the small room, and were so constructed that they could be opened or closed at pleasure. By a bellows attached to the free end of one or other of the tubes, he was enabled at any time to draw off the sewer air and subject it to examination. He did this on numerous occasions—at times when the weather was very hot and the neighbourhood of the sewer most offensive—at times when the temperature was very low and the place inodorous. As a general rule, the sewer gas yielded neither acid nor alkaline reaction, but sometimes the reaction was alkaline. At all times, mixed with the common air, carbonic acid gas, sulphuretted hydrogen, or sulphide of ammonium, were detectable. When the reaction was alkaline, ammonia was evidenced. He could detect no other foreign products in the sewer air. He tested for evidence of cyanogen compounds, without any affirmative indication.

When this inquiry had progressed for several weeks, he tried the influence of sewer air on animals exposed to it for a long time. For this purpose, he had made a chamber of wood and glass, with a cubic measurement of 5,832 cubic inches. One of the gutta percha tubes was introduced into it at the lower part; from the upper part he carried a tube in the form of a small chimney. At the point where the long tube piping from the chamber made a right angle upwards, it expanded into a conical box, in which a lamp was placed, so as to create when alight a constant upward draught. The whole played well. When the chamber was closed and the lamp arranged, a current of the sewer air was kept steadily passing through it. Dr. Barker also attached a pair of bellows to the chamber, in such a way that he could at any time remove the air by working them, and subject it to investigation, without interfering either with the experiment which might be progressing. In the experiments to be related, the animals operated on were placed in the chamber, were fed by a funnel whenever necessary, and were subjected to the sewer gases as is now to be described.

EXPERIMENT I. Dr. Barker placed a young dog in the box at twelve o'clock noon, and kept a current of the cesspool air passing constantly through the chamber by means of the chimney draught. Half an hour after the exposure, he became very uneasy and restless; he vomited, and had a distinct rigor. In the course of the day he suffered from diarrhœa and tenesmus. After twelve hours exposure, he was allowed fresh air; but on the next day, when he was removed altogether, he was exhausted. The diarrhœa and vomiting had ceased, but he refused food for some hours. However, he soon recovered.

The air breathed in the chamber by this animal yielded evidence of sulphuretted hydrogen.

EXPERIMENT II. On placing another dog in the box connected with the cesspool, and subjecting him to a free current of the foul air, similar results occurred. In ten minutes the creature became very uneasy, and soon afterwards suffered from vomiting and diarrhœa. After these effects, however, he suffered but very little, although kept in the chamber for five hours. After removal, he quickly recovered.

EXPERIMENT III. A mouse placed in a cage was let down into the cesspool, to within three inches of the surface of the contained soil. The cesspool was freely open above, so that there was no exclusion of air. The animal was also well plied with food. After this exposure for four days, the animal seemed lively and well, and took his food heartily. On the next day he was found dead.

EXPERIMENT IV. Another dog was subjected to the cesspool air during a period of twelve days, with such brief intermissions only as sufficed for rapid cleansing of the box. Throughout the time, food was liberally supplied him. The results were as follow:—

During the first day the animal was restless and uneasy, and refused food. On the second day vomiting came on, and was repeated frequently during the day. In the afternoon there was diarrhœa, accompanied by thirst and restlessness. On the third day, in the morning, he had marked shiverings, and refused all food. The feet were somewhat swollen. Towards evening he slept, but had a peculiar kind of tremor with each inspiration. On the fourth day he took food, and drank some milk. He slept during the forenoon, but was restless towards evening. On the fifth and sixth days he was much the same. On the seventh day he was restless and relaxed, and ate no food. On the eighth day he ate but little food, and was restless; he was by this time thinner and feeble. On the ninth