from change of air, and of all places that I have tried I find Buxton the best, except when the patient is suffering from rheumatism. Then I recommend either Malvern or Droitwich, so that the brine baths may be taken as part of the cure.

Laryngitis.

Although ulceration of the vocal cords never occurs in simple chronic laryngitis, still this is a condition which is very difficult to cure, and which very often relapses. It often occurs with chronic pharyngitis, and the same causes which have been mentioned in that condition should be looked for and eliminated as far as possible. The inhalation of steam medicated with compound tincture of benzoin or the oil of Scotch fir often gives relief. Care must be taken that the steam is not of too high a temperature, and I always advise patients to mix two-thirds of boiling water with one-third of cold water. If the secretions be viscid and difficult to get rid of, the best lozenge is one composed of ammonium chloride, the only drawback being the disagreeable taste; potassium iodide and tincture of nuxvomica in a mixture will often help in this condition. It may be necessary to apply astringent solutions direct to the seat of inflammation, and of these zinc chloride is the best; a wool brush made by twisting some wool tightly round a curved Playfair's probe should be used. The patient must be instructed to use the voice as little as possible.

Laryngitis may be due to the tubercle bacillus, and is then nearly always secondary to tuberculous disease of the lung. It may occur in quite the early stage of pulmonary tuberculosis, before any physical signs can be detected with the stethoscope, although the extent of the lung mischief may be apparent if the chest be examined with the *x* rays. The importance of an early diagnosis is very great, because laryngeal tuberculosis is not now the extremely fatal disease which it was thought to be some years ago. I have seen some cases make very good recoveries, even when both lungs were affected. The most important point in the treatment is rest to the larynx; the patient must be instructed not to raise his voice above a whisper. Even when ulceration has taken place, the patient need not necessarily lose hope, if only he is able to devote the necessary time and money to a long stay in a good sanatorium. I have more than one patient under my supervision in whom the ulcer has cicatrized, the lung trouble has become quiescent, and the patient has resumed work. Where ulceration is present and pain a prominent feature, insufflation of orthoform gives more relief than anything else, and the patient soon learns to do this for himself. Active local treatment, also, is sometimes necessary in these cases.

Malignant Disease of the Larynx.

Malignant new growths are divisible into two groups, intrinsic and extrinsic. The former include tumours growing from the ventricular bands, the ventricles, the vocal cords, and the parts immediately below the cords. The term "extrinsic" is applied to neoplasms taking their origin from the epiglottis, aryepiglottic folds, the interarytenoid fold, the pyriform sinus, and the posterior surface of the cricoid plate. The importance of this classification lies in the fact that intrinsic cancer is of slow growth, and secondary deposits only occur late in the disease when the growth has spread beyond the confines of the larynx. Early diagnosis and prompt operation give better results than follow removal of cancer in any other region of the body. Indeed, some very excellent results have been obtained since the method of attacking the disease by the external operation of thyrotomy has superseded the older methods of intralaryngeal removal.

A very different story has to be told of extrinsic cancer, for in these cases ulceration occurs early, and the glands are involved much earlier. The only condition which this could be mistaken for is a broken-down gumma. Even in these late cases, if the patient's general condition warrants it, an attempt should be made to extirpate the disease by complete excision of the larynx provided the serious danger of the operation is placed before the patient, and he prefers to face this rather than the inevitable suffering which must ensue if the disease is allowed to take its natural course. It should be laid down as an absolute rule that when an adult complains of hoarseness or alteration of voice of several weeks' duration, the larynx

should be carefully examined, and if there is diminished mobility of a vocal cord with or without a definite tumour, the help of a skilled laryngologist should be promptly obtained. Many lives and much suffering would be saved if this rule were rigidly observed by those who first see these cases.

ON THE WASSERMANN REACTION IN GENERAL PARALYSIS OF THE INSANE.*

BY

J. HENDERSON SMITH, M.B.,

THE LISTER INSTITUTE OF PREVENTIVE MEDICINE,

AND

J. P. CANDLER, M.D.,

THE PATHOLOGICAL LABORATORY, CLAYBURY ASYLUM.

WHEN the serum of a syphilitic patient is mixed with an extract made from the liver of a syphilitic fetus, the mixture possesses a property not possessed by either constituent alone in the same degree. It is able to take up complement. That this is the case is shown by adding to the mixture a suitable quantity of complement—that is, fresh guinea-pig serum—and after an interval adding sensitized red blood corpuscles. The red cells remain intact, suspended in the fluid; whereas, if the complement had not previously been taken up, they would have been laked.

A quite analogous phenomenon occurs in other conditions. If we mix the serum of a typhoid patient with an extract of typhoid bacilli, the mixture similarly acquires the property of fixing complement; and this is true for many other organisms and the corresponding serums. It seemed reasonable, therefore, to suppose, as Wassermann¹ did when he discovered the syphilis reaction, that in this case also he was dealing with an extract of the causal organism and the corresponding serum. In other words, the liver extract was active because it was an extract of the *Spirochaeta pallida* contained in the liver, and the serum was active because the patient had responded to the invasion of the spirochaete by producing an antibody in his blood. If this were so, the reaction would be specific; the complement would be fixed only if the serum came from a syphilitic, but would remain free if the serum were derived from a non-syphilitic; and a method for the serum-diagnosis of syphilis would have been devised. This proved to be the case. The reaction is specific for syphilis, and its value as an aid to diagnosis is admitted. The theoretical support, however, and the convenient explanation of the specificity which the typhoid and other analogies supplied, have had to be abandoned. It has been shown by many workers^{2,3,4} that the spirochaete is not an essential factor in the liver extract. Non-specific substances such as the heart of the guinea-pig,⁵ or even combinations of such relatively well-defined bodies as lecithin, oleic acid, and sodium oleate,⁶ may replace the syphilitic liver in the reaction. Its validity, therefore, as a means of diagnosing syphilis depends entirely on the empirical proof. This fortunately is present in embarrassing quantity. Wassermann⁷ himself a year ago could report the examination of 1010 non-syphilitic serums without a single positive result, and although there is now a small number of cases on record in which a positive reaction has been obtained in the absence of syphilis, it is everywhere accepted that the reaction is thoroughly reliable as an aid to diagnosis.

Immediately after his announcement of the method, Wassermann published with Plaut⁸ a paper showing that if the cerebro-spinal fluid from cases of general paralysis of the insane were used in place of the syphilitic serum in his reaction, the complement was fixed in the same manner. This was hailed at once as supplying an objective proof of the connexion of general paralysis with syphilis, which had long been asserted on clinical grounds.

At Dr. Mott's request we undertook the examination of a series of spinal fluids from cases of general paralysis and other diseases, the result of which we record in this paper.

* The results of a considerable portion of this work have already been reported by Dr. Mott in his Morison Lectures. See BRITISH MEDICAL JOURNAL, 1909, February 20th, p. 454.

The method we have employed is essentially that of Wassermann. The blood corpuscles used to test for the presence of complement are derived from the ox, freed from serum by thorough washing in salt solution. They are sensitized by the serum (heated thirty minutes at 56° C.) of rabbits which had received several injections of washed ox corpuscles. As extract we used at first a watery extract from the liver of a syphilitic fetus prepared in the manner described by Wassermann; but later we have used an alcoholic extract made by extracting 1 gram of crushed and pounded liver with 4 c.cm. alcohol at room temperature for two days and then filtering through paper. Such an alcoholic extract remains unaltered in the cold for weeks, and is incomparably more convenient to work with. We have found no difference in the results obtained with the alcoholic as compared with the aqueous extract. Meyer⁹ has stated that he obtains "10 per cent. finer results" with watery than with alcoholic extracts, but this has not been our experience. It can scarcely be the case for all livers, since only 25 per cent. of congenital syphilitic livers give an aqueous extract strong enough to be useful (as Georg Meier¹⁰ has stated), and practically all such livers give excellent alcoholic extracts. Before use we dilute our extract, adding 4 parts of salt solution to 1 of extract; the salt solution should be added slowly, as was pointed out by Sachs and Rondoni.¹¹ As complement fresh guinea-pig serum was employed. The spinal fluid was heated for half an hour at 56° C. before use.

As the strength in complement of guinea-pig serum varies for each animal, and a fresh animal was used for each day's work, the dose of rabbit serum necessary to adequately sensitize the red cells is determined each day—that is, the smallest quantity of rabbit serum which totally laked the red cells in presence of the complement was ascertained; and for use in the actual examination of the spinal fluid two to three times this ascertained dose is taken. For each spinal fluid the tubes are arranged in two series of three tubes each, into which the doses of spinal

fluid are measured, as in the example (see table at foot of page). To the first series are added the indicated doses of guinea-pig serum and liver extract, and finally salt solution to make the volume 2 c.cm.; to the second series only guinea-pig serum and salt solution to 2 c.cm. A general control series of tubes is set up as shown. Then all tubes are placed at 37° C. for one hour, to allow fixation of the complement, if any, to occur. Then to all tubes, except the last three of the control series, is added the rabbit serum; and, finally, each tube receives 1 c.cm. of a 5 per cent. suspension of washed ox corpuscles in salt solution. The tubes are then shaken and placed for a further two hours at 37°. The results are then read off, and a second reading is made after the tubes have stood in the cold overnight.

The main difference in this method from that employed by Wassermann is that we have used ox blood corpuscles instead of sheep's. Human serum contains no, or inappreciable, amounts of amboceptor capable of sensitizing ox red cells. It does, however, usually contain amboceptor sensitizing sheep's red cells, and the amount of this may vary greatly with different individuals—for example, 0.25 c.cm. serum from one person may be insufficient to sensitize a quantity of cells, which is fully sensitized by 0.025 c.cm. from another.^{12 13} This uncertainty regarding the degree of sensitization of the red cells is troublesome when one is working with serums, and, although in examining spinal fluids it is not so significant, we preferred to use ox cells throughout our work.

We have examined 175 samples of cerebro-spinal fluid, derived from 127 individuals. Of these 127, 64 were cases of general paralysis, and in 59, or 92.1 per cent., a positive result was obtained, while in 5, or 7.8 per cent., the reaction was negative. These 64 cases include 7 from which the fluid was obtained only after death, and all of these gave positive results. It might be objected that the examination of such *post-mortem* fluids could give no trustworthy results. In the case of cerebro-spinal fluids, however (whatever may be the case with serums¹⁴), this is not so. If the fluid is withdrawn within twenty-four hours

	0.1 c.cm. Guinea-pig Serum + 0.1 c.cm. Extract + Salt Solution to 2 c.cm.	0.1 c.cm. Guinea-pig Serum + Salt Solution to 2 c.cm.	Result.
A. Spinal fluid known to be positive :—			
0.8 c.cm.	—	Total haemolysis	Positive.
0.4 c.cm.	No haemolysis	"	
0.2 c.cm.	"	"	
0.1 c.cm.	"	—	
B. Spinal fluid from general paralysis :—			
0.8 c.cm.	—	Total haemolysis	Strongly positive.
0.4 c.cm.	No haemolysis	"	
0.2 c.cm.	"	"	
0.1 c.cm.	"	—	
C. Spinal fluid from general paralysis :—			
0.8 c.cm.	—	Total haemolysis	Positive, but weak.
0.4 c.cm.	Slight haemolysis	"	
0.2 c.cm.	Nearly total haemolysis	"	
0.1 c.cm.	Total haemolysis	—	
D. Spinal fluid from melancholia :—			
0.8 c.cm.	—	Total haemolysis	Negative.
0.4 c.cm.	Total haemolysis	"	
0.2 c.cm.	"	"	
0.1 c.cm.	"	—	
E. General controls :—			
0.1 c.cm. guinea-pig serum + 0.2 c.cm. extract + salt solution to 2 c.cm.	...	...	Total haemolysis.
0.1 c.cm. guinea-pig serum + salt solution to 2 c.cm.	...	...	"
* 0.1 c.cm. guinea-pig serum + salt solution to 2 c.cm.	...	...	No haemolysis.
* 2 c.cm. salt solution	...	...	"
* 0.2 c.cm. extract + salt solution to 2 c.cm.	...	...	"

* These tubes receive no rabbit serum.

after death from a body which has lain in the cold room during the interval (as was done in all our *post-mortem* cases), the Wassermann reaction is not altered. Examinations were made of such fluids from over 30 control cases, with no positive results. The spinal fluid even of a general paralytic, which had been negative during life, remained so after death. And in every instance when we have been able to examine *post mortem* the fluid from a case positive during life, the reaction has remained the same. If withdrawn from the lateral ventricle *post mortem* the fluid is always clouded with fine amorphous flocculi, but if taken from the spinal canal it is clear and limpid as in life. In 22 cases fluids from both the spinal canal and lateral ventricle were examined, with in every case corresponding results; either both were positive or both negative. It is noticeable, however, that the cloudy fluid, while remaining sterile, deteriorates more quickly on keeping than the clear fluid from the spinal canal. Our percentage of positive results agrees well with those obtained by the more recent workers—for example, Marie, Levaditi, and Yamanouchi¹⁵ obtained 93 per cent. positive in 30 cases, Plant¹⁶ 98 per cent. in 95 cases. The earlier work gave lower figures, Wassermann and Plant⁸ finding only 78 per cent. positive in 41 cases, and Marie and Levaditi⁹ 74 per cent. in 39 cases. Of 352 cases collected from the literature, 309, or 87.7 per cent., give positive results.

Marie and Levaditi² pointed out that the percentage of positive reactions increased as the disease was more advanced. It is not easy to classify satisfactorily such a disease as general paralysis into definite stages, but, on the whole, our results agree with those of the French authors. Thus, of 21 cases undoubtedly in the most advanced stages of the disease, over 90 per cent. gave the reaction, while of 16 cases certainly in a middle stage, only 81 per cent. were positive. We examined also 9 cases (not included above) in which the definite diagnosis could not be made clinically, though it was considered possible that general paralysis might develop. These all gave negative results. It will be interesting to observe the further progress of these cases clinically and with regard to the Wassermann reactions. In 6 cases of advanced paralysis we tested the urine, with negative results. This agrees with the finding of Hoehne,¹⁷ though Blumenthal and Wile¹⁸ state that they have obtained positive results with urine in a large number of cases of syphilis.

Fluids from 63 cases not suffering from general paralysis have been examined, in 32 of which the fluid was obtained during life. In no single instance was a positive reaction obtained. These cases included melancholia (9), senile mania (10), epilepsy (2), cerebral tumour (2), cerebellar tumour, syphilitic meningitis, lues cerebri, tuberculous meningitis, alcoholism (3), disseminated sclerosis, dementia praecox, post-haemorrhagic and other softenings; and a few fluids received for diagnosis of tuberculous or epidemic meningitis.

In suspected general paralysis a positive Wassermann reaction with the cerebro-spinal fluid is practically diagnostic. In only two other conditions is it ever obtained,† namely, in tabes and in syphilis located in the central nervous system of the meninges. In tabes it occurs regularly, but with much less frequency than in general paralysis. Thus in 112 cases from the literature positive results were obtained in 57, or 50 per cent. In cerebral syphilis it is stated to occur occasionally, though exceptionally.^{16 19 20} We have not yet met with a positive case, and it is evident that it is not the rule to obtain the reaction, although the serum may be strongly positive. These two diseases do not usually present difficulties in differential diagnosis, and apart from them the reaction is, so far as is yet known, decisive. It is unfortunate that it is precisely in the early stages of general paralysis, where diagnosis is most difficult, that the reaction most often fails us by giving a negative result. But even in the most advanced cases one occasionally obtains a clear negative. In one of our cases, two months before the patient died, the spinal fluid was negative, though his condition was such that he clearly had not long to live. Three days before death his serum was positive. The diagnosis was

confirmed *post mortem*, macroscopically and microscopically. The spinal fluid was withdrawn two hours after death, and specimens of lateral ventricle fluid and of serum were obtained twenty hours after death, all of these giving very strong positive reactions. In this instance, then, although the fluid eventually became positive, it was still negative a short time before death, when the disease was far advanced. We have already referred to a case in which the fluid remained negative throughout.

	Cerebro-spinal Fluid.	Serum.
General paralysis: In literature ...	352 cases, 309 positive— that is, 87.7 per cent.	285 cases, 247 positive— that is, 86.6 per cent.
Our cases ...	64 cases, 59 positive— that is, 92.1 per cent.	10 cases, 9 positive— that is, 90.0 per cent.
Tabes dorsalis: In literature ...	112 cases, 57 positive— that is, 50.8 per cent.	176 cases, 125 positive— that is, 71.0 per cent.

In most cases of general paralysis not only the spinal fluid is positive, but also the serum. It has been said that the serum is invariably positive; but this is not the case. Plant,¹⁶ Lesser,²¹ and Marinesco²² have indeed recorded 100 per cent. of positive reactions in 169 cases; but Marie, Levaditi, and Yamanouchi¹⁵ obtained only 59 per cent. positive in the serum (as against 93 per cent. in the spinal fluid), and others²³ have obtained even smaller figures. Of 285 cases in the literature, 86.6 per cent. gave positive reactions. We have been able to examine only 10 serums from paralytics, of which 9 were positive and 1 negative. These include a case in which the serum was positive but the spinal fluid negative. The occurrence of cases where the fluid is positive but the serum negative, and the fact that in ordinary syphilis the fluid is always negative though the serum is strongly positive, show that the existence of the reacting substance in the spinal fluid is not due to a mere filtration from the blood. The active body appears in the fluid as the result of a local production, due to an alteration in the nervous system itself or in its coverings. This alteration is of a specific character. The reaction does not always accompany the presence of excess of albumen in the fluid. Thus a positive reaction is not obtained in simple meningitis. Even in syphilitic meningitis we do not get a positive reaction. Through Dr. Mott's kindness we were able to examine such a case three times in two months, during which the cell contents fell under mercury from 350 cells in 1 c.cm. to 70, 20, and eventually none; all three examinations gave negative results. All such tests as depend on excess of globulin or albumen in the spinal fluid must, therefore, fail to be specific. Nor does a positive reaction necessarily accompany an excess of lymphocytes in the fluid (cf. Marie and Levaditi⁹). In 32 estimations of the presence of lymphocytes in the fluid of paralytics, we found these cells in marked excess in 31 and in slight excess in 1, but in only 29 was the reaction positive; while in our control series we have three times found the cells in excess, though the reaction was again negative. Further, the mere breaking up of nerve tissue, such as occurs in softening of the brain substance, whether post-haemorrhagic or otherwise, does not cause the fluid to react positively.

We must assume that there is a highly specific nervous lesion, occurring almost exclusively in general paralysis and tabes, accompanied by the presence in the cerebro-spinal fluid of a substance of a very special kind. It is usual to call this substance an antibody. There is, however, no ground for supposing that it is antibody in any ordinary sense of the term. Since the typhoid and other similar analogies have been abandoned, there is no valid reason to suppose that the substance is directly connected with the spirochaete in any such immediate relation as subsists between a typhoid or diphtheria antibody and its bacillus or toxin. So far as we know at present, it is merely a symptom, like the sugar in a diabetic urine. Its presence confers no immunity. It is normally found in the serum of some of the lower apes,²⁴ which can be readily infected with syphilis, and the infectivity of active virus is not neutralized *in vitro* by a serum rich in "antibody." In man its presence in the blood is usually taken to indicate that he is still the subject of active syphilis, which clinically may be entirely latent; and Citron²⁵ goes so far

* Sixteen of our paralysis cases have died since our first examination of the fluid, the diagnosis in all cases being confirmed by the *post-mortem* findings.

† One case is recorded by Levaditi and Yamanouchi, where positive result was obtained with the lumbar fluid in a case of sleeping sickness.

as to formulate this into a so-called "law," "a positive reaction denotes active syphilis." As a general statement, however, this cannot be correct. Tabes and general paralysis can scarcely be described as active syphilis, yet, as we have seen, the serum in these diseases gives a positive reaction in 70 to 90 per cent. of cases. In the spinal fluid it may be held even to be injurious rather than beneficial, since it has a definite affinity for so important a constituent of normal nervous tissue as lecithin. Further, its occurrence in the serum and spinal fluid of general paralysis and tabes, while it adds another argument to the clinical evidence connecting these diseases with syphilis, in no sense proves that connexion incontestably.

We have pleasure in thanking Dr. Mott for the interest he has taken in our work, and the assistance he has rendered us throughout. We also acknowledge with pleasure the kind assistance given us in obtaining material by Dr. Robert Jones, the Medical Superintendent, and Dr. Hughes, Medical Officer of the London County Asylum at Claybury; Dr. Bond, Medical Superintendent of Long Grove Asylum; Dr. Ingram and other medical officers of the London infirmaries; Mr. Gibbs, Surgeon at the London Lock Hospital; and Dr. Nepean Longridge, of Queen Charlotte's Lying-in Hospital for Women.

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PNEUMONIA MIGRANS INVOLVING THE WHOLE OF BOTH LUNGS, FOLLOWED BY EMPYEMA: RECOVERY.

By JAMES BANNERMAN, M.B., C.M.EDIN.,
STANHOPE, CO. DURHAM.

THE rarity of acute pneumonia lasting for over five weeks and involving the whole lung area justifies a record of the following case, in which the disease had affected *seriatim* the three lobes on the right side, commencing at the top, and the two lobes on the left side, commencing with the lower, the last involvement, that of the left upper lobe, being preceded by a localized pleuritic effusion. Such a protracted and extensive pneumonia must be a rare occurrence, and it was a matter of surprise to me that even the last phase of the disease ran quite an ordinary course.

On January 4th, 1909, I was asked to see a girl, M. D. F., aged 3½ years, and found her to have quite indefinite symptoms, without any rise of temperature. I was suspicious of pneumonia, as her father was suffering from it in the same house. The next day she had a high temperature (103° F.), but still I could not be sure of pneumonia. On January 6th I detected pneumonia, with all its typical signs, in the right upper lobe. The case progressed in an ordinary way till January 11th, when I observed an extension of the inflammation to the right middle lobe. Two days later much anxiety was caused by signs of heart failure, but happily the heart reacted well to strychnine. The following day (January 14th) there was well-marked pneumonic involvement of the lower lobe on the right side. I noted on January 15th a clearing up of the upper lobe; by January 18th it appeared to be normal. The temperature had kept up till now, varying from 101° to 105° F., but on the evening of January 19th it dropped to normal. The following day it rose to 104.6° F., with clear evidence of pneumonia in the left lower lobe. This fresh attack ran an ordinary course, the temperature only falling on January 29th.

On January 27th I had noted that the right base appeared practically normal. The next spread of the disease was on January 30th, when there were indefinite signs of trouble over the left upper lobe with an increase of temperature. The breath sounds were tubular and distant and percussion was dull; there was no increase of vocal fremitus or resonance. Over the left lower lobe there was undoubtedly no fluid, the breath sounds being tubular and loud with vocal fremitus and

resonance both increased. But I could not satisfy myself as to whether the condition in the left upper lobe was pleuritic effusion, or pneumonia, or both. This was cleared up on February 3rd by exploration through the third interspace in the anterior axillary region when I drew off some perfectly clear yellowish-green fluid. Exploration over the left lower lobe by sterilized needles at different places gave negative results. The child's breathing being very embarrassed, I aspirated the localized effusion over the left upper lobe, withdrawing 12 oz. of clear fluid. This gave much relief and the left upper lobe after the aspiration was quite resonant on percussion. But the temperature never came below 100.4° F., and on the morning of February 4th there was conclusive evidence of pneumonia in the left upper lobe, the resonance being impaired and the breath sounds assuming a high-pitched tubular type. This last attack of pneumonia also ran an ordinary course till February 10th, when the temperature fell to 98° F. after having been up almost uninterruptedly for thirty-six days.

With the child shockingly reduced by the long illness, I vainly hoped that some degree of acquired immunity would succeed in cutting short the latter attacks. The only comfort was that there was no other lobe to become involved. For a week the temperature remained down, but the child was in a pitiful state of weakness. Sickness supervened on February 17th, with a rise of temperature, and the child began to go downhill rapidly. The left base had never regained its resonance, but now it became absolutely dull, with distant bronchial breath sounds. On February 22nd the child's condition was extremely grave, but as the temperature kept down I waited and watched for a day or two longer. An increase of dyspnoea on February 25th induced me to explore the left base, when I found pus. The following day, with the kind assistance of my neighbour, Dr. Menzies of Wolsingham, I resected 1½ in. of the eighth rib in the posterior axillary line under local anaesthesia. I avoided a general anaesthetic on account of the weak and septic condition of the child, and I was more than satisfied with the efficacy of the local anaesthetic. The child lay still without making a cry when I excised the rib. A large quantity of pus was evacuated and two parallel rubber drainage tubes inserted. The case progressed favourably until a week after operation, when defective drainage caused some rise of temperature. I then irrigated the cavity daily for a few days with weak perchloride solution, followed by saline solution, and this brought away considerable masses of stinking pus clot. The after-progress was uninterrupted. Six weeks after operation she was healed up, strong, and running about with an expanded left lung.

I regret that nothing was attempted in the way of vaccine treatment, but in a scattered country practice such a refinement is hardly practicable.

THE CAUSES OF OBSTRUCTION PRODUCING CYANOSIS DURING THE NASAL ADMINISTRATION OF NITROUS OXIDE.

By F. TREWBY, M.R.C.S.,

ASSISTANT ANAESTHETIST TO ST. BARTHOLOMEW'S HOSPITAL; HOUSE-ANAESTHETIST TO THE ROYAL DENTAL HOSPITAL.

AFTER careful observation and examination of some thousands of gas administrations I have come to the conclusion that cyanosis in ordinary cases is merely mechanical, being mainly due to the size and shape of the palate and tongue.

The tongue varies from the large flabby to the compact muscular variety. While at rest, when the tip of the tongue is on the posterior surface of the lower incisors, the base of the tongue in the former variety may be ½ in. above the level of the grinding surface of the second molars, in the latter it may be well below the junction of the tooth and gum margin. The importance of the soft palate is its variable length; it may overlap the base of the tongue by an inch, or it may be separated by an aperture of an inch.

I. When these structures give rise to the greatest obstruction to free breathing, the patient has a large flabby tongue and a long, overlapping soft palate; the distance between the two is slight, or they may be in contact. Even to start with, the patient may find some difficulty during expiration, as the oro-pharyngeal aperture (by this I mean the aperture bounded above by the soft palate, at the sides by the pillars of the fauces, below by the base of the tongue) is small. Immediately the soft palate loses its tone, being placed at a sloping angle with the base of the tongue, it acts as an inspiratory valve, and is pressed down on the base of the tongue during expiration. This state of affairs may easily be brought about much earlier if gas is given under much pressure through the nose-piece, as the gas passing back into the