after suspension of treatment in primary cases, and two years in secondary cases.

The price of salvarsan and the amount of special work which such a scheme entails make it inapplicable under present conditions to patients in poor circumstances, but it is hardly necessary to say that the control of syphilis in its earlier stages affects the lives and happiness of a sufficiently large percentage of the population, present and future, to make it of national importance.

When we had to rely on mercury, it was practically hopeless to attempt such a control, but with salvarsan, which renders the patient non-infectious so quickly, and has so markedly shortened the duration of treatment, our course, though still difficult, has become clearer, and it is not too much to hope now that we shall be assisted with adequate measures in removing a great curse from our midst.

II.

THE TREATMENT OF SYPHILIS AT THE ROYAL NAVAL HOSPITAL, CHATHAM :

RESULTS DURING THE LAST TWO AND A HALF YEARS,
AND THE INFERENCES TO BE DRAWN
FROM THEM.

By SURGEON GILBERT BODLEY SCOTT, R.N.

To those members of the medical profession who have not had much experience in the modern treatment of syphilis, and who are considering it from the practitioner's point of view, the following observations may be of value.

During the period in which I was in charge of this work 1,100 cases were treated by salvarsan and neo-salvarsan and 2,500 injections were given. For its proper control Wassermann reactions are necessary, and in the period mentioned over 3,000 reactions were carried out.

There are between 108 and 130 beds at Chatham Hospital set apart for venereal disease only. The cases come from ships, chiefly in the North Sea, and the disease is contracted at the various ports on the East Coast of Scotland and England. In addition every few months batches of invalids arrive from ships abroad.

VARIATIONS IN VIRULENCE.

Three points in the incidence of the disease are worth mention. Some towns produce a much more virulent infection of syphilis than others do, and I always consider that the Bombay and Gibraltar infections are not only much more severe than English and Scottish, but are not so amenable to mercury. Syphilis contracted in China will produce in Europeans a very rapid and virulent form of the disease.

This geographical factor should undoubtedly influence the initial intensity of the treatment, its duration, and the prognosis. By prognosis I do not mean danger to life, but likelihood of relapse to active disease and a permanent positive Wassermann reaction.

EXTRAGENITAL INFECTION.

The treatment of extragenital chancres is influenced in the same manner. I have found that the fingers and lips are the most frequent sites.

Naval medical officers thoroughly realize the danger of lip infection on board ship, and men liable to pass on the infection are segregated in the sick-bay or sent to hospital.

Were this precaution not taken lip chancres would be far more frequent. It is just as necessary to instruct syphilitic patients in the prevention of the spread of disease as it is the tuberculous. The old stone fountain and chained drinking cup must have caused in hot weather many cases of syphilis and other communicable diseases. The prevention of finger chancres lies not with the removal of offending nails, splinters of wood, and other excuses, but in improving the morals of man.

DIAGNOSIS.

The early diagnosis of syphilis is of vast importance, and the bearing on the treatment, the prognosis, and the patient's life is not yet properly realized by three-quarters of the medical profession and not at all by the public.

If there is to be no return to the Contagious Diseases Act of 1864, then the abolition of the hidden plague in relation to syphilis must still lie in the treatment of men and women immediately they become sources of danger. Early diagnosis and treatment must go hand in hand, and to carry out this ideal successfully some kind of institution analogous to the tuberculin dispensary must be formed.

Importance of Early Diagnosis.

I will take the subject of early diagnosis first and summarize beforehand what I am going to say.

1. For our purpose the diagnosis by the Wassermann reaction is practically useless.
2. The only useful means of diagnosis of early syphilis is the demonstration of the *Spirochaeta pallida*.

I am firmly convinced that if all cases of syphilis were examined in the first stage of the disease, and in the first few days of that stage, before antiseptics have been applied, the spirochaete could and would be easily found.

I am also firmly convinced, although I cannot give definite proof, that if these early cases are treated by two or three injections of salvarsan or neo-salvarsan and a short course of mercury, 99 per cent. of these will be cured.

When once the Wassermann reaction has become positive or the sore hard and indurated this treatment will not cure more than 60 per cent., and I should remain doubtful of that 60 for the next fifteen years.

If, however, a prolonged course of mercury—two to three years, with intermissions—is given to these cases in conjunction with salvarsan, a better outlook is obtained.

Not many years ago we allowed our patients to reach the secondary stage before we made a diagnosis and treated them. What would be said if we to-day waited to see if secondary deposits of cancer occurred in the liver in a suspected case of epithelioma of the lip, or a tumour in the region of the appendix to burst before diagnosing an abscess?

It sounds ludicrous, but it is really not more absurd than at the present day to wait for a positive Wassermann reaction or secondary symptoms. I am of the opinion that when once a man has developed secondary syphilis at least 60 per cent. of his chances of being cured have gone. When the disease has been established for a year I do not believe there are more than 20 per cent. in whom a cure is effected or in whom the infection dies out. I except from this statement McDonagh's method of treatment, because I have had no practical experience of its results and am not qualified to give an opinion. Why should we condemn our patients to such a poor outlook when early diagnosis and treatment give such a good one?

Demonstration of the Spirochaete.

The diagnosis of early syphilis by demonstration of the spirochaete is easier than examining for tubercle bacilli in the sputum.

The methods are two: (1) By Chinese ink; (2) by the dark-ground illumination. Both these methods are described in any book dealing with laboratory work, but a laboratory is not required, only the most simple apparatus, a microscope, and experience in recognizing the various forms of spirochaete.

If we do not get our patients in this early stage these methods are still easily employed, provided that no antiseptic has been applied to the sore, and that it is not a healing one.

Under these two latter conditions a diagnosis must be made from its character or by Wassermann's reaction. A hard indurated sore, if not malignant, is almost certainly syphilitic. A soft shallow one more often turns out to be syphilis than "chancreoid." Therefore, the nature of a soft sore cannot be diagnosed by its appearance.

Date of Wassermann's Reaction.

Wassermann's reaction becomes positive about three to four weeks after the appearance of the sore in most cases. Sometimes it is earlier, sometimes later. I refer here to reactions done by Fleming's method, or the original when using cholesterin antigen.

The appearance of the reaction probably means that the infection has passed beyond the local stage, that it is

general and producing certain tissue changes. If this be so, it is obvious that our aim must be to treat the patient effectively before the reaction is positive, and not only my results but those of all of us who have had experience in salvarsan treatment and Wassermann work bear this out.

Should there be any doubt about the nature of an early case I think that we should err on the side of a positive rather than a negative diagnosis. Treatment is simple and quickly carried out, and the gain is well worth the risk. On the other hand, if we wait for other diagnostic signs the outlook for cure is greatly clouded.

If medical men are to be able to carry out this early diagnosis and treatment it is evident that all those likely to run the risk of being infected must also fully realize its value. To obtain this ideal this important point must be brought home again and again to men or women in any suitable form of organized lecture dealing with venereal disease.

TREATMENT.

The treatment of syphilis has passed through great changes during the last few years, discussions have been innumerable, and opinions on the relative value of the methods most diverse.

In the Early Stage.

There is one great fact, however, of primary importance on which we are unanimous, and that is the value of early treatment. By this I mean treatment before the Wassermann reaction has become positive.

My own results have produced 100 per cent. of negative reactions lasting from one to two years after treatment had been stopped. To these cases I had given two or three injections of 0.6 gram of salvarsan, or 0.6 and 0.75 gram of neo-salvarsan, combined with three months' treatment by mercury inunctions, injections, by the mouth, or combined. The mercury is pushed until salivation occurs; this I consider most important.

In giving intramuscular injections of mercury equivalent to a grain of the metal or a grain of calomel this effect is usually not obtained, nor is it by the mouth unless large doses are used. Therefore for the first week or so with either of the above forms of treatment I order inunctions of mercury with a lanoline basis, and continue the combination until salivation occurs.

It will often be found that the tonic effect of salvarsan permits a much larger amount of mercury to be given than could otherwise be done. Most cases, I am convinced, do not get sufficient mercury at the outset. Generally mercurial injections are not enough.

This intensive treatment needs care and discrimination. It would not do to mercurialize a patient with pyorrhoea alveolaris, with non-syphilitic albuminuria, or one who is very anaemic.

If there is an idiosyncrasy to mercury, it will be shown in the first few days and harm prevented. One has not the same control if an equivalent amount of the metal were given intramuscularly, and it is on this account that I prefer the combination.

In Secondary and Late Syphilis.

We are all agreed upon the necessity of early treatment and of combining mercury with salvarsan in all stages of the disease. There is, however, a great diversity of opinion in the method of treatment which we should adopt in secondary and late syphilis. Were salvarsan or neo-salvarsan injections free from risk we could give them *ad libitum* and settle once and for all the question of its producing permanent cures in these stages of the disease. Repeated injections of either drug are, however, accompanied by a most definite risk, and, moreover, one which we are in many cases absolutely unable to guard against, a large number of fatal results having occurred in men who, apart from their disease, seemed perfectly strong and healthy.

Causes of Accidents in Treatment.

I have had one of these extremely distressing results, and a second man died under very suspicious circumstances. Two other cases caused great anxiety for twenty-four hours and were saved by a procedure which I shall mention later.

To enable us to adopt a line of treatment we must have some idea of the causation of these fatal results, so that, as far as is possible, we may avoid them.

Deaths have occurred during or immediately after an injection from heart failure, or a few days after from acute nephritis. I think they are due to the administration of salvarsan to cases where desperate measures were deemed advisable, or where the drug was contraindicated and should not have been given.

What concerns us now are the deaths which occur after repeated injections of salvarsan or neo-salvarsan in men in whom, after thorough examination, there were no contraindications found.

I will briefly review the explanations which have been adduced.

1. Accumulation of the Drug.

An overdose of arsenic is brought about by non-excretion of the first or previous doses, a further injection being sufficient to cause poisonous effects.

In one of the naval hospitals a fatal case occurred after the second injection, and in the brain arsenic was demonstrated by Fleet Surgeon Bassett-Smith.

On reading the reports on the cases at the end of this paper it will be evident that the removal of a considerable quantity of blood in these serious conditions produces a very marked beneficial result, and this fact is, I think, rather in favour of arsenical poisoning.

It is difficult to explain by this theory the fact that in most of the fatal results symptoms have not occurred until forty-eight hours after the second injection. Yet this interval followed in the case above where arsenic was found.

2. A Form of Anaphylaxis.

The first injection causes, by the destruction of the parasite, a substance which produces hypersensibility. On repeating the injection a week or ten days later more spirochaetes are killed, and a further output of these substances occurs, and dangerous symptoms of anaphylaxis result.

Perhaps quinine has the same effect in malaria, where blackwater fever results by selective action of the poison on the renal epithelium.

It is very difficult to produce evidence for or against this theory. If it is correct we are between the devil and the deep sea, for if we prevent it by giving injections at very short intervals we run the risk of accumulation of the drug, and if we space our interval, even I suppose to a year, we do not get rid of the danger.

3. Damage to the Renal Epithelium causing Retention of the Products of Metabolism and Uraemia.

I do not think this need be seriously considered. In none of my cases was the urine diminished. In the case that died there was a faint cloud of albumin only on boiling, and no inflammation of the kidney *post mortem*. One case which recovered gave albumin in the urine for one day only, the other never showed albumin at all. The case the nature of which was complicated by diphtheria did not give albumin tests, nor were the kidneys abnormal on *post-mortem* examination.

Contracted pupils and vomiting were absent, and in all the onset was sudden, resembling in every case that of an epileptic fit.

4. Epileptic Manifestations.

One case which recovered gave later a definite history of fits. The other case which recovered gave a family history of fits, but said that he had had none himself.

The parents of the man who died stated that to their knowledge their son had not had fits. A similar statement was obtained from the parents of the man who died with diphtheria.

I do not think that epilepsy explains these cases, yet I consider it dangerous to treat epileptics with salvarsan.

Stimulation of the Spirochaetes.

I think that the explanation of many cases is as follows: The first injection of salvarsan or neo-salvarsan has, instead of killing the spirochaetes, excited them to increased activity. This I know does occur. I have seen over a dozen cases in which no benefit followed the injection, but ten days later the throat and tonsils have become acutely inflamed and ulcerated, and in the lesions the specific spirochaetes were swarming. This is not the same as Herxheimer's reaction, which occurs a few hours after.

This late effect is not seen in lesions on the penis, because local treatment has been applied; occasionally it is seen in the skin, a rash suddenly appearing, and conforming to the syphilitic type.

One would only expect this to occur in tissues which are usually implicated, such as skin, mucous membrane of mouth, brain, nerves, arteries, and kidney; and if this is the case in one of these regions why should it not be so in the others? There is clinical evidence to show that this does happen.

The so-called neuro-recurrences are examples of this, and give rise to intractable headache, optic neuritis, deafness, and facial paralysis. One of my cases developed acute aortitis with considerable cardiac embarrassment, which cleared up with large doses of mercury.

What follows in these cases when a second injection is given?

1. The excessive local development of the spirochaete in the areas I have mentioned is prevented from doing permanent injury; or

2. An acute general toxæmia is produced, causing marked local effects. This may be due to destruction of all the parasites by the arsenic, thus setting free a poisonous dose of endotoxin. I do not think this happens. The arsenic is not in sufficient quantity; the symptoms should come on within an hour of the repeated injection, and not forty-eight hours after.

I think the explanation is that the destruction of some of the spirochaetes allows an antigen in the form of endotoxin or other destructive product to pass into the circulation; this excites the body cells to produce spirochaeticidal substances (analogous to bacteriolysin) in excessive quantity. These substances in the presence of complement cause the sudden and complete destruction of the local masses of spirochaetes, and thus set free a large and intensely poisonous dose of endotoxin, which produces a general and local effect.

On *post-mortem* examination of the tissues so affected no spirochaetes are found. None were demonstrated in the brain examined by Fleet Surgeon Bassett-Smith, nor could I detect any in the arteries of my fatal case, although a most extraordinary condition of endarteritis was present.

This condition is analogous to Wolff-Eisner's "sterile death," where in acute bacterial infections the protective forces have caused the destruction of the bacteria to such an extent that a poisonous dose has been freed and the animal dies, and the blood is found to be sterile.

This explanation accounts for the interval of forty-eight hours between the injection and the onset of symptoms, it accounts for the sudden onset, and for the pathological condition found *post-mortem*—namely, cerebral inflammation, acute endarteritis, acute nephritis and suppression of urine.

If this is the correct explanation, then the vast importance of thorough mercury treatment for a month before giving the next injection is obvious. During this month excessive local developments of parasites will be got under control, or they will have made themselves evident and given us the needed warning.

We cannot, however, ignore Fleet Surgeon Bassett-Smith's analysis of urine in salvarsan cases, where for fourteen days arsenic was present, and the danger of accumulating doses must be recognized.

The Results of Treatment by Salvarsan and Neo-salvarsan.

I have pointed out the ways in which serious symptoms may develop, and indicated the lines on which we should proceed in order to avoid them.

Are we justified in advising our patients to run the risk entailed by salvarsan or neo-salvarsan treatment?

To decide this we must have some idea of the result obtained. I will take first the results as judged by Wassermann's reaction. I employed for these the original method, but used cholesterin antigen.

Of 25 cases of primary syphilis with negative Wassermann reaction 100 per cent. remained negative one year after treatment. Five of these developed fresh infections, and one of the five a third infection. They were treated by two injections of salvarsan and three months' mercury.

All the following cases were recommended to carry out mercury treatment until the Wassermann reaction had

been negative for six months. I have ascertained the fact that mercury was given.

I will give the number of cases and the percentage showing positive reactions six or more months after treatment.

Primary Syphilis with Positive Reaction.

6 cases received one injection ...	100% positive.
74 cases received two injections ...	31% "
18 cases received three injections...	22% "

Secondary Syphilis under One Year's Duration.

184 cases received two injections ...	50% positive.
52 cases received three injections...	40% "

Syphilis of more than One Year's Duration.

135 cases received two injections ...	70% positive.
31 cases received three injections...	58% "

These 506 cases are all those on whom I was able to do reactions six or more months after their injections; they were all taking mercury at the time their blood was taken.

Up to two years after treatment I found cases becoming positive which I had placed in the negative columns; these had to be transferred to the positive, and for this reason the above results are better than the same batch of cases would give a year hence. How much is due to mercury and how much to salvarsan I cannot tell.

Doses.

The doses that I have employed have been for an average man 0.6 of a gram of salvarsan and 0.75 of neo-salvarsan, the first injection in this case being 0.6 gram; these have been given at intervals of seven to ten days.

All men are kept in bed on the day of the injection, and, needless to say, a very complete examination of every case is made before treatment.

Relapse.

Let us now examine the incidence of relapse cases—that is, those returning with active disease.

Of the first 1,000 cases only 22 have relapsed to my knowledge, the time since treatment varying from six months to two years. Of these, 10 had received only one injection. The significance of this lies in the fact that I only treated 80 men with one injection and 920 with two or more. Therefore it may be said that after one injection 12.5 per cent. relapse, and after two or more only 1.3 per cent.

I do not think that this is quite a fair estimate of the number of cases relapsing, as it was not possible to follow all, but it is accurate enough to be very suggestive as to the relative value of one and two injections.

Another very important result from the naval point of view is the immense reduction in the number of days a man is sick in hospital. The average per case has been twenty-two. Staff Surgeon Shaw has pointed out the enormous reduction that this form of treatment has produced when compared with the days of mercury alone. Every one knows the power that salvarsan has of rapidly healing lesions, and there would be no gain in my adding further instances.

The sense of well-being and fitness which most patients experience and retain for at least a year after salvarsan administration is a point worthy of note. As I have pointed out before, it allows a more thorough treatment by mercury.

Course of Treatment to be followed.

We have now summed up the results of the line of treatment which I have adopted. We are dealing with men presenting no contraindication to salvarsan injections, and who have been fully examined. What advice are we to give?

In primary syphilis with negative Wassermann reaction, cure the disease by intensive treatment, giving at least two injections of salvarsan at intervals of ten to fourteen days, or as soon as the arsenic is out of the urine when tested by Marsh's test. A three months' course of mercury must be started at the same time.

The danger of accumulation is avoided; anaphylaxis we cannot avoid; we can ascertain a history of epilepsy; the kidney theory I do not believe, and the danger, which I maintain is the most important, is absent, as no excessive increase of spirochaetes in a dangerous area is possible.

In primary syphilis with a positive reaction, and in the secondary stage of less than a year's standing, I advise one injection of salvarsan, followed a month later by another, and possibly a third, and mercury for a year after the reaction has been negative. In this stage of the disease to give injections at seven-day intervals is attended by a definite risk to the patient's life. As only about half of these cases attain a negative reaction, and we do not know how long they will keep it, I do not consider that we are justified in trying to stamp out the disease in this manner. It is on this ground that I advise the longer interval between injections and the protracted course. It holds out quite as good a chance of cure.

Syphilis of over One Year's Duration.

Where there are no active signs I do not consider it worth the patient's while to have salvarsan.

If there are active signs injections may be given at a month's interval. Mercury must be the chief means of preventing relapses.

Some cases will possibly lose their infection; in others the disease will remain latent for the patient's life, liable to recrudescence when circumstances are favourable.

Mercury should probably be continued at intervals for life.

Where the patient fully understands the risk entailed and expresses a very definite wish to have it, the following course may be given. Weekly injections of neo-salvarsan intravenously and mercury intramuscularly until a negative Wassermann reaction has been obtained two days after the last neo-salvarsan injection. Seven to nine injections may be required to produce this. I have practically very little experience in this form of treatment, which is that recommended and carried out by McDonagh. For many reasons it is not practicable in the navy, where the prolonged treatment is being carried out.

Against this latter method the following arguments are adduced:

1. That an arsenic resistant strain of spirochaete is formed.

2. That the disease is simply rendered latent by prolonged treatment by driving the parasites into unapproachable tissues. This is almost analogous to quinine in small doses given to malarial patients. I think that this result is just as likely to follow a seven or nine weeks' course as a longer one.

Comparison between the two methods cannot be made until very careful statistics have been compiled. If there is an extra risk entailed in the frequent injections, then a corresponding increase in its value must be shown to compensate for it.

Throughout this paper I must ask the reader to consider that what I have said applies equally to salvarsan and neo-salvarsan, except where the latter is specially mentioned. I refer also to intravenous and in no case to intramuscular injections of either of the above drugs.

I wish to emphasize the value of a method of treatment which used to be frequently employed, but of late years has died out. This is arsenic by the mouth. In cases where salvarsan cannot be given it often produces a more rapid disappearance of syphilitic lesions than mercury.

CASES.

Epileptiform Convulsions (2 Cases).

One had a secondary syphilitic rash; the other was an earlier case, with glandular enlargement and primary sore. Wassermann's reaction was positive in both.

Typical epileptic seizures, in one case preceded by a cry, followed in both forty hours after the second injection of 0.6 gram of salvarsan. Fits became more and more frequent till they occurred every five minutes. In each case there was a stage of rigidity lasting one minute with considerable cyanosis. There was no clonic stage, and urine was not passed involuntarily. Complete unconsciousness was present. One case was bled to the extent of 20 oz., the other 15 oz. Marked improvement occurred at once; but in the latter case, where 15 oz. only were removed, the fits began again after an hour. Chloroform inhalations were given and no more fits took place. Both men remained unconscious for fifteen hours, but had completely recovered after twenty-four. One case had albumin in his urine, which was drawn off by catheter, but it disappeared next day. The other had none. Bromide was given per rectum.

One man gave a definite history of epileptic fits which he had had when ashore, and so had not been found out. The other admitted epilepsy in the family.

Convulsions followed by Death (1 Case).

This man had a two years' history of syphilis; he had received twenty-eight injections of mercury. The active disease had appeared four months before I saw him. The Wassermann reaction was positive. The first injection of 0.6 gram of neo-salvarsan was well borne, and his weight increased during the next week. Seven days from the first a second injection of 0.75 gram of neo-salvarsan was given. Forty-six hours after this, while in bed, an epileptiform seizure occurred, which was preceded by a cry; the blood tension was very high, convulsive movements frequent, followed later by opisthotonus. The respirations increased in rate to 36 per minute, and the pulse to 123, and thirty-six hours after the onset the patient died. Consciousness was never regained after the onset of symptoms.

Treatment consisted in bleeding, inhalations of chloroform, bromide, and removal of spinal fluid by lumbar puncture; this, however, was not under increased pressure.

Post mortem the meninges were congested; the brain substance appeared normal. The aorta (thoracic and abdominal), the internal and external iliacs, and the mesenteric arteries and coeliac axis showed a most marked condition of acute endarteritis.

The kidneys appeared normal, and all other organs. There was a faint cloud of albumin in the urine when boiled. The urine was passed, when alive, involuntarily; there did not appear to be any diminution in quantity. On microscopical examination no spirochaetes were found in the arterial walls. Cultures from the meninges and spinal fluid and blood were sterile.

Paralysis following Diphtheria (1 Case).

History of sore throat for a month. Syphilitic rash was present. Wassermann reaction was positive. Two injections of salvarsan with ten days' interval were given, each dose being 0.6 gram. Forty-eight hours after the second injection the throat, which was normal on admission, became inflamed, and the uvula covered with typical diphtheritic membrane, from which I obtained pure cultures of Klebs-Loeffler bacillus. Soon after this the patient complained of pain in the back, the legs became paralysed, then the sphincters, consciousness was lost, breathing became stertorous from paralysis of the soft palate; after this the left arm became paralysed, and finally the diaphragm, death ensuing eighteen hours after the onset of the first symptoms. There were no signs of cerebral irritation, the pupils were equal.

The *post-mortem* examination gave no clue to the cause of the illness. Cultures from brain and meninges were sterile. The liver and kidneys were tested for arsenic by Marsh's test, and no signs of the drug found. The urine contained no albumin. The clinical picture presented by this and the above case was totally different, and I do not consider that it was due to salvarsan, but that it was an acute diphtheritic toxæmia. The following case strengthens this diagnosis.

Man, aged 22, history of being sick at home for two weeks with tonsillitis. Returned to duty at the end of this time, but complained of pain in the legs. He was on this account sent to hospital. The day after admission both legs became paralysed, knee-jerks were lost, the paralysis rapidly spread, involving sphincters, arms, soft palate, tongue, and finally the diaphragm, and death occurred within thirty-six hours of admission.

This case had never had salvarsan, nor was there a history of syphilis. The last two cases were clinically almost identical; the second case also producing typical diphtheria bacilli, and the throat being characterized by the same sudden recrudescence to the typical diphtherial condition.

These cases point very strongly to diphtheria being the cause of Landry's paralysis.

Facial Paralysis.

This occurred suddenly two months after one injection. The Wassermann reaction was positive.

Deafness.

Two months after one injection for secondary syphilis almost complete deafness came on within a week. The condition was bilateral. A second injection caused an improvement, but the man had to be invalided. This case had been under mercury treatment since the first injection.

Optic Neuritis.

This man received an injection of 0.6 gram of salvarsan for syphilitic rash. Two months later he complained of pain in the eyes and headache. Ophthalmoscopic examination showed marked optic neuritis. The Wassermann reaction was positive. I at once administered a second injection of salvarsan. The result was wonderful; all symptoms rapidly disappeared, and the man was discharged to duty with normal vision, and has remained perfectly well for over eighteen months.

Cerebral Lesions.

Fleet Surgeon Bassett-Smith has kindly permitted me to add some notes made from his report on the pathological condition found on examination of the brain of a man who died after the second injection of neo-salvarsan.

The meningeal vessels were markedly congested. Oedema was present in the cortex of the frontal area.

On the right side the Sylvian vein was full of hard clot extending half-way up the frontal lobe.

The centrum ovale on section showed punctate haemorrhagic spots. The internal capsule of both sides showed haemorrhagic areas with acute capillary congestion. The pons and medulla showed the same condition. Arsenic was found to be present.

Microscopically.—The infiltrated areas showed congestion of all the small vessels, with collections of blood cells round about the capillaries.

In portions impregnated with silver by Levaditi's method no spirochaetes were detected.

Sections of the larger arteries in the Sylvian fissure showed periarteritis and endarteritis.

Sections of the thrombosed Sylvian vein did not indicate an infective origin.

I wish to express my indebtedness to Fleet Surgeon Bassett-Smith, C.B., and also to Surgeons Campbell Ross, W. G. Custance, and V. J. Richardson, all of whom have largely participated in the work done at Chatham.

"STANDARD" OPAQUE MEAL FOR RADIOGRAPHIC EXAMINATIONS.

By ALFRED C. JORDAN, M.D. CANTAB., M.R.C.P.

For radiographic examinations opaque meals are administered with several different objects in view. The purpose may be to elucidate physiological principles, as in the examination of the healthy stomach, and various kinds of meal must be used to ascertain the effect of different foods on gastric peristalsis, and on the rate at which the stomach empties itself. In all such investigations the presence of the opaque substance (usually a salt of bismuth or the sulphate of barium) modifies the character of the food so greatly (making it unpleasantly dry and earthy) that the conclusions cannot be assumed to be directly applicable to the case of ordinary meals. We are driven to determine the behaviour of the healthy stomach with our opaque meals, and to endeavour to discover which deviations from the usual behaviour are due to organic disease.

In my own case the opaque meal is almost always given to ascertain the presence of disease, or abnormality of structure or of function, and in the vast majority of cases I examine not merely the stomach but the entire length of the alimentary tract from the mouth to the rectum. My method of procedure has been evolved, little by little, as my experience has grown, the main object being to obtain the greatest amount of trustworthy information. To attain this object I have made a practice of following my patients to the operating room whenever an opportunity has arisen. In this way I have been able to compare the appearances shown in my radiograms with the condition of the parts as actually revealed at the operation.

The "Standard Meal" I am about to describe is that used by me in the majority of cases in which I make a complete investigation of the digestive tract, and this includes examinations for intestinal stasis.

METHOD OF EXAMINATION FOR INTESTINAL STASIS.

The patient takes his usual breakfast. About one or two hours later he comes for his first examination.

An emulsion is prepared consisting of bismuth carbonate, 4 oz.; sugar of milk, 1½ oz.; water in amount sufficient to make an emulsion which is not thick.

The whole drink makes less than a tumblerful. In the case of big subjects, 5 oz., or even 6 oz., of bismuth carbonate are given, with a correspondingly greater amount

of sugar of milk and water; even this makes no more than a tumblerful. The water should not be quite cold, especially in winter. I have not had a single case in which this dose has produced the slightest untoward result.

The sugar of milk in this "standard meal" has a threefold function: (1) To make a satisfactory emulsion, (2) to increase the bulk of the meal, and (3) to make the meal pleasant. In some cases it has a mild laxative effect.

The patient is first examined upright on my revolving saddle seat with canvas back.¹ The chest is examined, first in the anterior view, and then in the right anterior oblique view. While in this position (R.A.O.) the patient begins to drink the bismuth emulsion, and its course down the oesophagus is well shown; if this appears normal, and the bismuth begins to enter the stomach at once, the patient is swung round to the anterior position, and the level of the great curvature of the stomach is noted as the first portions of bismuth reach it. The final level of the great curvature is lower, the difference being due to the weight of the bismuth.

After the vertical examination the patient is examined on the couch—supine, supine after lying on the right side, prone. All details regarding the size, shape, and position of the stomach and duodenum may be determined at this examination, and accurate observations may be made of the motor activities of these organs. Subsequently the bismuth passes through the small and large intestines, and enables them to be studied to great advantage. My results have been published from time to time.²

OBJECTIONS TO THE METHOD EXAMINED.

Several objections have been raised to my method. I propose to consider them individually.

1. "The bismuth carbonate neutralizes the free acid in the stomach." I use it for this very reason; it overcomes (partially at any rate) the pyloric contraction, whether physiological or pathological, and allows the bismuth to enter the duodenum in sufficient amount to give a good view of it (the duodenum), and to permit of an accurate study of its form and functions.

1A. "But if you neutralize the free acid in the stomach you diminish the peristaltic activity of the stomach." A few inconclusive experiments have been described in support of this contention, but an extended experience with bismuth carbonate has shown me that active peristalsis may be observed when this salt is used, while the excessively powerful peristalsis and the reversed peristalsis that occur in some cases of pyloric stenosis may be demonstrated to perfection with an emulsion of bismuth carbonate given in the way I have described.

2. "If you give the bismuth when there is food in the stomach, and allow more food to be taken before all the bismuth has left the stomach, you cannot form correct estimates of the rate at which the stomach empties itself." True, but the rate of emptying of the stomach is not a point of paramount importance; certainly it is of far less importance than a proper view of the duodenum, and the duodenum cannot, in my experience, be properly examined if the bismuth (or barium) be given on an empty stomach, for in the latter case the bismuth has to encounter persistent spasm at the pylorus—a physiological effect which I have recently described and explained.³ Further, even with barium given on an empty stomach, the rate at which this organ rids itself of the barium varies greatly on different occasions in the same subject. One day the barium may be all out in two or three hours, while another day it may take six or eight hours, or even longer. Patients do not appreciate being kept without food so long! There is a further grave objection to withholding food beyond the usual time: one of the most powerful factors in causing the contents of the large bowel to advance is the taking of food. It follows that the results obtained for the rate of passage through the intestines are seriously invalidated in cases in which food is withheld.

3. "If you place a large dose of bismuth in the stomach, and then cause your patient to lie on the right side, the duodenum will become unnaturally distended and will give a picture which does not correspond with the actual state of affairs." The answer to this is conclusive. All my patients are examined in this way. My reports show that in a dozen patients I get evidence of marked duodenal distension in one or two only (40 in the last 334 patients);