

**Report on experiments with Nastin B in Leprosy / by Major S. Anderson and Major L. Rogers ; with notes by Colonel G.F.A. Harris, inspector-general of Civil Hospitals, Bengal.**

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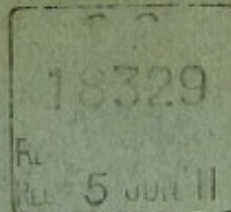


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# REPORT ON EXPERIMENTS WITH NASTIN B

IN



# LEPROSY

BY

MAJOR S. ANDERSON, M.B., I.M.S.,

AND

MAJOR L. ROGERS, M.D., I.M.S.,

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## WITH NOTES

BY

COLONEL G. F. A. HARRIS, M.D., V.H.S., I.M.S.,

*Inspector-General of Civil Hospitals, Bengal.*



CALCUTTA:

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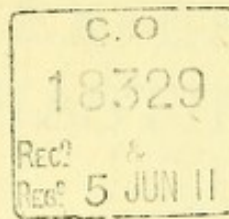
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# REPORT ON EXPERIMENTS WITH NASTIN B

## LEPROSY

MAJOR R. ANDERSON, M.D., F.R.C.S.,  
and  
MAJOR J. H. HUGHES, M.D., F.R.C.S.

## WITH NOTES

BY  
GEOFFREY H. F. A. HARRIS, M.D., F.R.C.S.,  
Fellow of the Royal Society, and  
Fellow of the Royal College of Physicians.



LONDON:  
H. K. LEWIS, 14, ADELPHI WING,  
ST. MARTIN'S LANE.  
1911.



No. 869 D., dated Darjeeling, the 10th June 1910.

From—COLONEL G. F. A. HARRIS, M.D., I.M.S., Inspector-General of Civil Hospitals, Bengal,

To—The Secretary to the Government of Bengal, Municipal Department.

IN May of last year the Government of India forwarded a Despatch from the Secretary of State on the subject of Dr. Deycke's "Nastine" treatment of leprosy and asked for a report on any experiments bearing on the treatment that might have been made in Bengal. There had up to that time been no proper trial of this treatment in this province. The Government were informed accordingly, and on my predecessor Colonel Macrae's suggestion it was decided to try it in the two Leper Asylums of Gobra and Purulia, a grant of Rs. 500 being sanctioned from Provincial Revenues for the purpose of purchasing the "Nastine", etc. The result has now been reported in two reports from Major Anderson, I.M.S., Civil Surgeon of Manbhum, and one from Major L. Rogers, I.M.S., Professor of Pathology at the Medical College, Calcutta, which are herewith submitted for the information of Government. Before commenting on them I should like to make some general remarks on "Nastine" and what the system of treatment with it means.

2. "Nastine" is the name given by Drs. Deycke Pasha and Reschad Bey, two Physicians in the Imperial Ottoman Service. It is a peculiar fatty substance extracted from 14 days old pure cultures of a species of *Streptothrix* (*S. Leproides*) which is found in cases of leprosy to be associated with the true bacillus of leprosy. In 1905 these investigators found that when pure cultures of this *Streptothrix* were applied by way of injection to sufferers from leprosy, they affected a far-reaching improvement and retrogression of the symptoms, and a destructive influence on the excitor of leprosy, being unmistakable in bacterioscopic and histological aspects. Following up their observations and making further experiments, chemical and cultural, they succeeded in separating a well-defined fatty substance which on account of its firm and close texture they called "Nastine." It is a firm white paraffin-like substance with a peculiar fruity odour, and is of the colour and consistence of white bees' wax. It is not chemically a wax, but a genuine chemical fat, *i.e.*, an ester of glycerine.

(a) *How Nastine is supposed to act.*—Drs. Deycke and Reschad assume that the lepra bacillus contains a fatty substance similar to, or biologically related to Nastine to which the lepra exciters are indebted for their chemical property of resisting the aggressive substance of the human organism. They further assume that the Nastine injection simply means an active immunisation against the same resisting fatty substance with which the lepra bacilli are impregnated and on which is dependent their comparative unassailability. In plain language the fatty envelopment of the leprosy bacilli (which these observers assume to exist) not only prevents these bacilli themselves from being attacked and destroyed (by the human phagocytes) but by its action on the healthy human tissues, renders them (*i.e.*, the tissues) favourable for subsequent invasion by the leprosy bacillus, *i.e.*, it prepares the soil for the seed. The Nastine though it does not act directly on the leprosy bacilli, has a definite action in immunising the healthy tissues against the action of this fat (that is the tissues resist this assumed specification of the fat), and the soil is not only not rendered unfavourable, but the healthy phagocytes of the tissues can attack and destroy the leprosy bacilli. These observers further state that the Nastine treatment is followed by an enormous amount of bacteriolysis (*i.e.*, destruction of bacilli), and that the chemical substances set free as a result of this destruction, some of which are absorbed into the body, are quite sufficient to explain the general febrile symptoms which follow Nastine injections.

(b) *Technique and results of Nastine injections.*—The original observers used 1 per cent. solutions of Nastine in pure warm sterilised olive oil beginning with  $\frac{1}{2}$  Pravaz syringeful or 0.005 of a gramme, and repeating the injection a week later. If the injections are well tolerated, one may after sometime inject half a syringeful every fifth or sixth day. A larger dose is unnecessary, in fact



they are convinced that larger doses may frustrate the process of immunisation and prove injurious. The leading motives throughout the treatment are—

- (1) To avoid as far as possible fairly pronounced general reaction, and
- (2) As soon as serious phenomena of reaction are observed on leprosy parts, to wait until such reactions have quite disappeared before renewing the injections.

They go on to state that the reactions on the leprosy tissue vary from—

- (i) Simple pulp-like softening of the leprosy nodules, allowing these to be partially or completely pressed out.
- (ii) Oedematous swelling of the lepromata.
- (iii) Aseptic suppuration.
- (iv) Typical necrosis of leprosy nodules and infiltrations.

The original observers took particular care to emphasise the fact that after Nastine injection, all or any of the above processes solely affect leprosy tissues and never affect normal tissues. The final conclusions about this Nastine treatment are:—

- (1) That Nastine injections will exercise no curative influence in the severest and most advanced cases of leprosy, especially if accompanied with complications of internal organs. Such cases are quite incurable by any treatment known to date.
- (2) In cases of somewhat less severity "essential improvement," i.e., cure is rare, but with careful dosage the condition may be prevented from getting worse.
- (3) In cases of medium severity, or in light cases the leprosy processes can, in most cases, be arrested, and generally a more or less important retrogression of the leprosy symptoms may ensue. In some cases even an apparently complete disappearance of the externally visible leprosy products and the specific exciters may be obtained.

(c) *Further development of the Nastine cure, etc.*—From the original Nastine is derived what the inventors call Nastine-B. This is a combination of Nastine with Benzoylchloride dissolved in Olive oil. Benzoylchloride, according to the original observer, is chemically a very active substance, which in *vivo* and *vitro* displays a fat-removing action on so-called acid-proof bacilli, which process directly prepared these bacilli for further disintegration (bacteriolysis). This particular chemical substance is only effective in the living organism when combined with the immunising substance, i.e., with Nastine, and is looked upon in the sense of the modern theory of immunity (Erichs theory) as a "complement." Drs. Deycke and Reschad further assert that not only is the therapeutic action of Nastine-B compared with pure Nastine far more trustworthy and constant, but also that the dangerous reactions not infrequently met in experiments with pure Nastine, are not met with, or much less frequently met with, in Nastine B. Therefore only Nastine B is recommended for general practical use in the specific treatment of leprosy. It is put up in ampoules containing the Nastine and Benzoylchloride dissolved in sterilised olive oil. The proportion of olive oil and Benzoylchloride are constant in all the concentrations, viz., 1 c.c. of olive oil and Benzoylchloride Nastin-B<sub>1</sub> is called the standard solution. It is stated by the inventors of the treatment that a correctly applied subcutaneous injection of Nastin-B only causes a transitory burning pain, but no induration, abscess or sloughing action. In addition to the Nastin-B, the inventors of this treatment also supply what they term the complement called "K-tyn" which they recommended should be injected in cases where from the outset even the weakest dilution of Nastin-B causes too violent a reaction. What this Kety is, I do not know and am unable to find out from the papers\*. The inventors of the treatment are of opinion that the Nastin treatment of leprosy can only be carried out in clinical institutions where the patients can be kept under strict control and observation. This would suggest that the treatment is not entirely free from danger, and is unsuitable for general use. The opinions, however, of

\*Unless it be a 2% solution of Benzoylchloride alone?



some other experimenters are not in agreement with this. Occasionally it is advisable to suspend the treatment for some months. Finally Drs. Deycke and Reschad are of opinion that "the less one expects rapid and miraculous results, and the more one controls one's own and the patient's impatience, the better will be the results which will be obtained."

(d) *Previous trials of Nastine.*—The first Indian Medical Service officer to use Nastine in case of leprosy was, as far as I can ascertain, Captain T. S. B. Williams, Residency Surgeon, Persian Gulf. He read a paper on the subject at the recent Medical Congress at Bombay which was re-published by the Government of India and circulated in this Province in September 1909. Captain Williams at first experimented with six cases. He reported:—"After six months treatment I was so impressed with the possibilities of the method, that I increased my cases under treatment to twelve." He says that in seven of these 12 cases, the general health as a result of the leprosy was very much affected and in each case there was rapid and marked improvement in this particular after coming under the treatment, and he says, "all seven patients are getting quite strong and enjoying their lives." As regards *Lepromata* and *Ulcers* with the exception of one case all improved and there appeared to be no doubt of the fact that the treatment was the cause of very definite local changes, viz., softening, breaking down and the formation of ulcers, which generally healed quickly. In one case, he says, the changes could be produced with "almost mathematical precision." Other medical men whom he called to witness his results agreed that "there was no doubt about the injections causing local reactions." As regards *Anæsthesia* the cases in which this was a prominent symptom all showed marked improvement. *Microscopical examinations* were frequently made and Captain Williams himself considered, and his opinion was confirmed by other medical men, that definite changes were observed in the bacilli, viz., loss of acid-proofness and degenerative changes, etc.

*General Remarks.*—Captain Williams considered that his results were decidedly encouraging, as in most cases the improvement was very marked, and the specific action of the remedy very definite. After his experience he thought that Dr. Deycke was quite justified in all he claimed for his treatment. In all Captain Williams' 12 cases the treatment would appear to have arrested further development of the leprosy processes actually present at the beginning of the treatment, whilst in the majority even better results than this were obtained, and in some cases the treatment almost amounted to a practical cure.

He considered that there was no reason why the remedy should not be used for ordinary out-patient practice, and thought the most promising cases for the immunising form were early cases.

3. The experiments recently made in Bengal are conflicting. While on the one hand Major Rogers' report, based on the results of a trial on four cases at the Gobra Leper Asylum in Calcutta is not very encouraging, Major Anderson's experience at Purulia is distinctly so. Major Rogers sums up his experience as follows:—"I regret to say that up to early in April or after four months' treatment the results have been nil." He also quotes the opinion of an Australian observer, Dr. J. Ashburton Thompson, the permanent head of the Department of Public Health in New South Wales, who says in *The British Medical Journal* of 5th March 1910 that after a year's experience he found "Nastine an entirely inert body save for some irritant efforts limited to the seat of injection." Dr. Thompson quotes others whose experiences were similar to his own. According to *The Journal of Tropical Medicine* the general consensus of opinion expressed at the International Conference of Leprosy held in Norway in August 1909 also seems to be adverse to the curative properties of Nastine in leprosy. A Dr. Lenz experienced similar failure in trials conducted in Equatorial Africa. Experiments in Manilla were also unsuccessful. The two brothers, Drs. Neve in Kashmir who have also experimented with Nastine in India, are not very enthusiastic about its cure, though they thought it premature to conclude anything for or against it. They, however, considered it to be a very expensive and prolonged form of treatment. Against all these unfavourable results there is the experience of Professor Ziemann in the Cameroons. His experiments with Nastine proved so favourable that he asked for a special grant of £ 1,100 for further trial. Three of Major Rogers' cases finding no benefit after some months' trial refused



to continue the treatment. One patient died whilst under treatment, but it is reported that the fatal termination had no relation to the specific treatment which was being tried, but was brought about by the patient voluntarily causing a burn on his body, which was followed by extensive sloughing and blood poisoning from which he died. Major Rogers states that out of seven more lepers who have volunteered for treatment, he has selected two of the most recent and favourable cases for further trial, the result of which he will report in due course.

4. Major Anderson's experiments were more successful than those of Major Rogers. He has submitted two reports of his trial of Nastine at the Leper Asylum at Purulia, and on some cases sent to him from other Mission stations. The standard solution used by Major Anderson was Nastine-B and the injections were given in the selected cases at regular intervals once a week to begin with. By not giving them too often, local and general reactions were avoided. The use of Nastine-B<sub>2</sub> was restricted to cases with particularly persistent leprous formations. In ophthalmic and nerve leprosy cases Nastine-B was only used. In his first report Major Anderson says that six lepers in the Purulia Asylum underwent the treatment. They were almost all moderately severe cases of the mixed type of leprosy and the duration of the disease varied from 2 to 10 years. The diagnosis in each case was confirmed by microscopical examination of stained smears of nasal mucus. Bearing in mind the numerous failures and disappointing results which had attended previous so-called leprosy "specifics" carried out on somewhat similar lines, Major Anderson approached the subject in a proper spirit of scientific scepticism and reports as follows :—

- (a) *Results on the general health.*—Four of the six cases showed a marked improvement in general health from the commencement of the treatment. They slept better, their appetites improved and they had a general feeling of lightness.
- (b) *Lepromata and Ulcers.*—With one exception in all the cases there was a marked improvement in this respect, but whether this will be permanent or not, it is not possible to assert. In the case that failed to show any improvement, fresh lesions developed. In other cases a local reaction occurred at the seat of the lepromata causing a breaking down of the nodules. Major Anderson is satisfied that Nastine-B has a specification on the nodules.
- (c) *Anæsthesia.*—With one exception all the cases showed some improvement, and in one case there seemed to be almost complete disappearance of the anæsthesia as a result of the treatment.
- (d) *Temperature.*—A slight rise in the patient's temperature after commencing the treatment did not seem to militate against the progress of the case, and the general health continued to improve.
- (e) *Conclusion.*—That though after two months' observation of the treatment, it is not possible to dogmatise one way or the other, still on the whole Major Anderson is satisfied that the treatment of leprosy with Nastine-B constitute a real advance in combating the disease. The treatment seemed to abort the various leprous processes going on in the body, and at the same time to remove a portion of the existing disease, and to prolong the lives of the lepers. But the point is, will the improvement be permanent?

Major Anderson's second report says that the treatment and observation were continued on the cases previously reported on, and that the careful notes he took distinctly show that the improvement previously brought about in the general health and nutrition, and in the condition of the lepromata, and the anæsthesia was maintained. All his cases seem to have markedly



improved in health and their weights increased. In one case only on account of fresh ulcers occurring which healed in from three to four weeks, the patient refused to continue the treatment. Under ordinary circumstances lepers are liable to attacks of recurrent fever which tend to weaken them still further. Under the Nastine treatment similar attacks did occasionally occur, but did not seem to weaken the patients, as they all gained in weight. The patients themselves volunteered to continue the treatment, as after some time they began to believe in its efficacy, and when not given it would ask the reason why. In Major Anderson's experience those patients who were most tolerant of the Nastine treatment, and in whom no reaction took place, undoubtedly showed the most improvement. This was particularly shown in the case of a man who came to Purulia from Tippera to be treated as a private patient. Major Anderson gives details of the local reaction seen in his cases: he never observed the "very turbulent reactions which are directly dangerous to life." From a study of the cases which have been under his observation he is inclined to think that "whilst in all cases only the action of Nastin is desirable, and that after some weeks of tolerance, yet some reaction in a comparatively robust type with few foci, will not only show a marked change in the local lepromata as evidenced by softening and absorption, but also a marked general improvement", and he thinks that "whilst the ordinary injections gradually cause absorption round the periphery of the local tumour, the intensity of reactions not only aborts what remains of the local tumours, but abolishes the disease *in situ*."

Further in the most favourable cases in the nodular and mixed variety, the commencement of improvement was shown by tingling and creeping sensations in the part and by a return of sensation. Major Anderson is of opinion that treatment with intervals of rest is the correct method, and that if there is any sign of reaction after the usual doses, to recommence with  $\frac{1}{2}$  doses: he agrees with Deycke that large doses may frustrate the process of immunisation and prove injurious. Therefore, he thinks, the best plan is to give small doses for years and at long intervals. The anaesthesia was decidedly benefited as patients walked better and unconscious burning of the limbs during the cooking of food was not seen. He recommends the beginning of the cold weather in India as the best time for initiating a course of treatment with Nastin. He doubts whether in Nastin we have a real cure for leprosy, although it undoubtedly aborts the leprous process going on in the body, just in the same manner as mercurials act in syphilis, and, just as in syphilis one cannot be positive that the cure is permanent, so the same applies to Nastine, but Major Anderson thinks it conceivable and even likely that after the primary course, further courses of say four injections at intervals of six months extended over a long period, will not only prevent the spread of any foci remaining over, but will abort the disease absolutely. Some of his patients were so confident of cure that they asked to be housed separately, so as to obviate the possibility of re-infection by contact or through food. Major Anderson sees no reason why the Nastine treatment should not be used in the out-patient departments of hospitals. His final conclusion is that he has found the treatment undoubtedly palliative and he thinks it may be permanently curative if persevered with. He admits, however, that it is too soon to form any definite conclusion on this last point, but he is inclined to agree with Deycke, that Nastin will in suitable cases effect a partial or complete amelioration of the symptoms of leprosy. Its main drawbacks are the expense of the remedy, each dose costing about one rupee four annas, and the length of time the treatment takes. For these reasons it cannot be used on a very large scale, *i. e.*, in large leper asylums.

5. On the whole Major Anderson's results are distinctly encouraging, and, I think, justify a further trial of the remedy in the Purulia Asylum. I accordingly recommend this being done during the current year, fresh cases being used for experiment. In the meantime the cases which have already been experimented on, should be kept carefully under observation, and a further report as to the permanence or otherwise of the cure should be submitted in six months' time.

6. Both Majors Rogers and Anderson deserve credit for their careful experiments and for the interesting reports they have submitted.



## REPORT OF THE NASTIN TREATMENT OF LEPROSY IN CALCUTTA.

Owing to my absence on duty in Simla in the autumn, it was not until the beginning of December 1909 that I was able to commence a trial of the Nastin treatment in the Gobra Leper Asylum, Entally, in accordance with the orders of the Bengal Government. Owing to the cost of the material amounting to about one rupee a dose and the length of time the treatment must be continued in order to get marked results, it was essential to begin with a small number of cases. As advanced nerve leprosy is not very amenable to the drug and the effects can be more easily and certainly demonstrated in the tubercular form of the disease, I directed my attention especially to that type. Under the Leprosy Act only those sufferers who have actual ulcerations can be segregated in the Gobra Asylum, and ulcerative cases are not considered to be so favourable for the Nastin treatment. I, therefore, found only four patients in the Gobra Asylum who offered good prospect of demonstrable amelioration, three of whom had no ulcerations and had voluntarily gone there for treatment. No. 1 was a Jewish girl, aged 15, with very prominent keloid looking tubercles, most marked on the arms, legs and face. She had been seen by me in the Medical College Hospital about a year before, when the disease was in an early stage, but it had increased considerably since that time. Still the disease was comparatively recent and presented exceptionally favourable conditions for the treatment.

No. 2 was a Eurasian man, aged 23, who had suffered from the disease for 10 years. He presented typical leonine expression of the face, and also had tubercles on the hands, thus being a characteristic tubercular leper of longer duration than Case 1. He was keen on the treatment, and an intelligent man, and so a good subject for the test.

No. 3 was a Mahomedan male, aged 35, who presented the most marked tubercular leprosy that I have ever seen on his feet, where the skin was irregularly thickened to a height of nearly half an inch, while less marked tubercles were found on the hands, etc. He was also an intelligent man, who had voluntarily come for treatment, being a zemindar in the Chittagong district.

No. 4 was a Mahomedan male, aged 30, who presented a mixed type of the disease of 6 years' duration. He showed some tubercular thickening of the face and ears, while the ulnar nerves were markedly thickened, and he had lost several of his toes, on one of which there had been some ulceration a short time previously. He had suffered from the disease for three years and was a typical example of the class of the disease which form the great bulk of asylum cases. These four patients were the most favourable cases for the treatment out of about 100 persons in the institution.

Nastin-B<sub>1</sub> was used for the injections, which were given weekly in accordance with the directions, visits to the asylum being made by me for that purpose. All four cases were examined microscopically and very numerous leprosy bacilli were readily obtained from the lesions.

*Results.*—I regret to say that up to early in April or after four months' treatment the results have been *nil*.

No. 1 showed no reaction at all for some weeks. Then there was slight swelling and apparent softening of some of the patches, but no diminution in their size followed, but if anything, there has been some increase, and she cannot be persuaded to continue the treatment. The case has thus been extremely disappointing.

No. 2 was a man of cheerful and sanguine disposition, and declared that he felt somewhat better for the injections, although no visible improvement took place. Some increase of sensation was, however, obtained and he thought the swellings had also decreased slightly. On 10th March he complained of pain in his right femoral glands, and two days later he heated a small stone in the fire and wrapped it in cloth and applied it to his groin. Soon after he developed an acute inflammation of the skin and subcutaneous tissues of the thigh and leg with high fever, and died on the 21st March, although the inflammation had greatly subsided under treatment.



No. 3—No change whatever appeared in this case and on the 4th of February he refused to continue the treatment.

No. 4.—No change whatever had taken place in this patient up to the 4th of March when he declined to continue the injections.

These results have been very disappointing in comparison with those reported by some observers, although equally unsatisfactory ones have been recorded in the certain instances after much longer trials than I have yet been able to carry out. Thus Dr. J. Ashburton Thompson, writing in *The British Medical Journal* of 5th March 1910, as a result of a year's experience, records his opinion: "Thus Nastin showed itself in my hands an entirely inert body, save for some irritant effect limited to the seat of injection." He also quotes others whose experience was similar to his own. According to *The Journal of Tropical Medicine*: "The general consensus of opinion expressed at the International Conference on Leprosy held in Norway in August 1909, seems to be adverse to the curative properties of Nastin in leprosy." It is unfortunate that none of the four patients originally selected by me remain available for continued treatment. I have only been able to get seven more patients to volunteer for it, and have selected the two most recent and favourable ones for a further trial. The great cost of the chemical, about one rupee a dose, and the length of time treatment must be carried on, leave but little hope of many permanent cures being obtained in the chronic cases met with in Indian leper asylums, although in early cases it may be of more value, according to the experience of some writers.

LEONARD ROGERS, M.D., MAJOR, I.M.S.,

*Professor of Pathology, Medical College.*

CALCUTTA,

*The 23rd April, 1910.*

A PRELIMINARY REPORT ON EXPERIMENTS WITH PROFESSOR DEYCKE'S  
NASTIN-B IN THE TREATMENT OF LEPROSY.

A real leper cure has been the aim of investigators in this disease for many years. Time after time a new one has arisen only to die a natural death. It is therefore necessary that one should approach this subject with caution, remembering the disappointment that resulted after a full and complete trial of former so-called cures for this disease.

*General scope of the enquiry.*—On the 20th August 1909 I was deputed by Government to carry out injections of Nastin-B amongst a limited number of cases in the Purulia Leper Asylum and for this purpose a sum of Rs. 250 was placed at my disposal. In this, the largest asylum in India, one would have expected there was a good selection from which one could pick out suitable cases, but this as will appear later was not actually the case.

A former Superintendent, the late Rev. Dr. Hahn, informed me that previous attempts to inoculate Asylum inmates had disappointing and even grave results, and the memory of these attempts still lingered in the minds of the present inmates.

When it is remembered that almost all those treated by former injections suffered from both local and general reaction with fever, malaise, headache, &c., then it was very essential in the present instance to approach the inmates in a tactful manner.

After some time the Hospital Assistant in charge, who exerts a good deal of influence amongst the lepers was successful in obtaining volunteers and after an explanation had been given them of the method and its results, the selected persons agreed to go through with the treatment.

It is unnecessary to relate here the details of Professor Deycke's original paper, full particulars of which are given in a paper presented on his behalf at the Bombay Medical Congress, 1909, by Captain Williams, I.M.S.

In addition, directions regarding the treatment of leprosy is sent out with each box of Nastin-B (copy attached).



*Deycke's Postulates.*—Professor Deycke has laid down certain rules which must be followed in the selection of cases and in the treatment generally, and therefore the aim of this report is to compare and confirm or otherwise the results obtained with those of the author.

These postulates must be carefully borne in mind, and no observations can be said to be complete and in no instance can it be said to be satisfactorily proved, that the morbid processes in leprosy are aborted if the following conditions remain unfulfilled :—

- (1) The standard solution for use in the treatment of leprosy is Nastin B<sub>1</sub>.
- (2) That the injections must be given at regular intervals, say 1 week to begin with; local and general reactions can only occur when the injections are given too frequently.
- (3) The use of Nastin B<sub>2</sub> is restricted to cases with few and particularly persistent leprosy formations.
- (4) That in ophthalmic and nerve leprosy Nastin B<sub>2</sub> is prohibited, and hence in the beginning Nastin B<sub>1</sub> should only be employed in these types of cases.
- (5) That should general or local Nastin reactions occur, it is imperative to discontinue the injections until these phenomena have completely disappeared.
- (6) That there is no objection from the onset in combining other methods of treatment to shorten the period of administration, as, *e.g.*, along with the chemical caustic treatment of the nasal membranes.
- (7) That strict control is necessary, and therefore the treatment should only be carried out in institutions, owing to its long duration, and the fact that wonderful results must not be expected too soon.
- (8) That leprosy cases of the severest nature, *i.e.*, cases in which the internal organs are affected, cases of anæmia and cachexia should be excluded from the specific Nastin B therapy. All the other leprosy affections are suitable for the treatment.
- (9) That in most of them the leprosy process will be arrested, in many instances there will result a more or less pronounced improvement which in some cases approximates a cure.

**The selected cases.**—Scheube states :— The signs and symptoms of leprosy depend on the seat of the leprosy neoplasms. The symptoms vary according as the neoplasm is situated in the skin, the mucous membranes, or peripheral nerves. These differences in the aspect of the disease have led to the recognition of two forms of leprosy, nodular leprosy and nerve leprosy. These two forms, though correct from a practical standpoint, are nevertheless not strictly divided one from the other, for they frequently overlap, the symptoms of one form being often combined with those of the other during the course of the disease, or even from its commencement. It is very seldom that quite pure cases of one or the other form are observed; the majority belong to the mixed form.

That the above statement is correct is well known to those who have had experience of the disease; almost all the "volunteers" were of the mixed type, of a moderate degree of severity, and the duration of the disease varied from 2 to 10 years. Of the six volunteers, four showed a predominance of one or other type, *viz.*, cases 3 and 6 are mainly "nodular," the anaesthesia being secondary, cases 4 and 5 are true "nerve leprosy" and cases 1 and 2 displayed both forms equally.

All the above cases were deemed suitable for the Nastin B treatment and the diagnosis in each one was confirmed by microscopical examination of smears of nasal mucus stained by the Ziehl-Neelsen method. (Slides sent herewith.)

Of those rejected, leprosy of one—two years' duration with commencing disease were considered unsuitable as their symptoms were not sufficiently pronounced, *viz.*, in those of the nodular type the neoplasms were but slight and in those with nerve leprosy the areas affected were not markedly anaesthetic. Others again had to be rejected on account of the severity of the disease, being either anæmic or cachectic or cases in which the internal organs were affected.



Considering that each injection of Nastin B costs Re. 1-4 and that Rs. 250 were sanctioned, six seemed a reasonable number wherewith to carry out the experiments.

The following are the notes of my cases :—

**Case I.**—Kartick, son of Lobgon, caste Kurmi, village Pondro, Chas, Manbhum. His age is about 35 years.

*Previous history.*—He states that the disease started with a blister over the inner side of the right ankle about six or seven years ago.

Since some two years ago he has noticed the flattening of his nose; occasionally he has crawling sensations with shooting pains every day in the evenings, more especially in the limbs.

He has lost the hair on the outer halves of both eyebrows and there are lepromata over the eyebrows, over the nose especially towards its base, giving that organ a flattened appearance, also on the cheeks, lips, and slightly of the lobes of both ears.

Anæsthesia is present on both legs up to a definite limit an inch or two above each knee joint, so that the entire limbs below the knee are without feeling. The face also is somewhat anæsthetic.

There is a deep ulcer present over the base of the middle toe of the right foot. His present weight is 92½ lbs.

Note made on the 16th September after two injections.

He states that he has a lighter feeling than he had before, a feeling of *bien être*. Previously the dorsum of the right foot did not perspire, but now it does.

*Present condition.*—The treatment with Nastin B, was commenced on the 2nd September and injections of 1 c.c. were given regularly once a week. He now states that the burning pain in the upper extremities has disappeared, there is no aching nor itching feeling as he had formerly, whilst the crawling sensations have disappeared, except over the eyebrows. The swelling of the fingers has become less and his appetite has much improved, and he now sleeps better than before. He states that his sexual power has increased.

The nodular swellings over the eyebrows, lips, nose and ears have diminished in size with a corresponding improvement in the appearance of the face.

Up to date (3rd November) he has had altogether eight injections, and his weight now is 102½ lbs., a gain of 10 lbs. in the interval.

**Case 2.**—Lilu, son of Durga Charan, caste Teli, of village Makimpur, Manbhum. The disease started with an anæsthetic patch over the left buttock and this gradually extended until almost the whole left leg was involved; this commenced some nine years ago.

Later anæsthesia began over the face, probably due to nodular swellings present over both eyebrows, accompanied by loss of hair, nodules over the base of the nose which is flattened, and though there was at one time marked swelling of the lobes of the ears, this is now slight. He had numbness of both feet and hands and he felt a crawling sensation over the eyebrows, especially on warm days. There is also some swelling over the knuckles of both hands. Last year he had two ulcers on the sole of each foot. His weight is 103 lbs.

A course of treatment with Nastin B, was commenced on the 2nd September and five injections of 1 c. c. each have been given. During this interval he was attacked on 5th October with benign tertian malaria and so long as the temperature remained above 99°F. the injections were stopped. (*Vide* temperature chart.)

*Present condition.*—He feels better, but is somewhat weak after the fever. Sensation in the upper extremities has much improved: he can use the fingers freely and there is no dull sensation at the tips as before.

Previously he had marked burning sensations in both the feet and arms, but now this has disappeared from the arms and has diminished in the feet, and only some of this sensation remains at the root of the toes. The itching



and aching sensations he had over the body have entirely disappeared. He states that he sleeps better than before, and that his appetite has improved. The swelling over the knuckles and of the toes has markedly diminished, and also that of the eyebrows.

His weight is now 101 lbs., a decrease of 2 lbs., which is not much considering that he had two severe "go's" of malarial fever superimposed upon the treatment with Nastin B.

**Case 3.**—Masidhoni, daughter of Joydhor, aged 48, of village Pachara, Manbazar, Manbhum.

The disease commenced some seven or eight years ago by a peculiar burning sensation over the whole body and she still continued to experience the same sensation from the knees and elbows downwards in all the limbs. She occasionally has tingling sensations down both forearms and these persist and are worse at night.

There is marked loss of hair over the eyebrows and nodular thickening is marked over the nose, over both cheeks and the lower jaw; the lobes of the ears are also markedly thickened.

There is swelling of all the fingers and they have a glossy appearance, but the nails are fairly healthy. There is swelling of all the toes and all the nails with the exception of those of the big toes are almost completely atrophied, whilst that of the second toe of the right foot has disappeared.

Anæsthesia is present in both hands up to the wrist and in both feet up to the ankle. She states that she had an ulcer over the base of the left great toe two years ago. Her weight is 79 lbs.

This is quite the most remarkable case of the series; the treatment was commenced on the 2nd September with Nastin B, and after two injections on the 16th she of her own accord stated:—"Previously I felt heavy, but now I feel lighter; the crawling and tingling sensations, together with the shooting pains, I now only feel occasionally. I can feel that sensation is returning in both the hands and feet and in walking I can now feel the ground better than before."

After eight injections she now states that the aching and itching sensations in the nose, cheeks, lips, forehead and ears have disappeared. The lepromata in all these situations have markedly diminished in size and her physiognomy has changed, only some flattening of the nose remaining. Sensation at the tips of the fingers has also improved, but the burning sensation over the body still persists. The swelling of the feet has lessened, whilst the anæsthesia in both the hands and feet has almost completely gone. Sleep which was previously disturbed has now become sound. Her weight is now 80 lbs., a gain of 1 lb. in the interval of treatment.

**Case 4.**—Bhaghu, son of Fagu Mohata, *act*, 25, caste Kurmi, of village Boa, Chas, Manbhum. Duration of disease 5 to 6 years.

He first noticed a blister over the right knee and later a blister occurred over the great toe of the left foot, and at the same time an ulcer formed under the ball of the same toe. Later some small ulcers on the left hand and an ulcer 2" by 1" occurred on the outer side of the middle of the calf of the left leg. At present there is an ulcer on the second toe of the right foot, which developed over a year ago. The second toe of the right foot has lost the nail entirely, is enlarged and puffy, and is half an inch shorter than normal. The median nerves are normal.

He had crawling sensations almost continuously practically all over his body and also a burning sensation in both feet.

After six injections of Nastin B, commencing on the 16th September, he states that the itching has disappeared all over the body, but some burning sensation still remains in the feet. The anæsthesia remains almost similar to that when the treatment was first begun. Sleep has become undisturbed, and his appetite has improved. The ulcer on the second toe of the right foot has healed and an ulcer which developed on the first toe of the left foot has now also healed.



**Case 5.**—Sorola, daughter of Digum, *aet.* 20, caste Bauri, of village Tallaghor, Gourandi, Manbhum.

*Previous history.*—Neither her father nor mother had leprosy, and there was no one in her house affected. A paternal uncle had leprosy, but he died before she was born and she was not aware of any of her relatives who were affected with the disease. She was married when five years old to one Doyal and he also was not affected. She contracted the disease some three years ago and first noticed a blister over the inner side of the leg just above the right ankle. Just then she had a burning sensation all over the body, also crawling sensations were marked. For over two years she has had contraction of the flexor tendons of the right hand and now there is distinct *main-en-griffe*. The left hand also shows commencing contraction of the flexors of all the fingers except the thumb. The fingers show a stumping and atrophy of all the distal phalanges and the nails are small and aborted—this is more marked in the right than in the left hand. There are burning and crawling sensations in both forearms, in the legs up to the knee and also in the face. There are some small lepromata on the face, especially over the nose giving it a somewhat flattened appearance.

After the first injection on the 16th September, she stated that the burning and crawling sensations left her, but have since returned and all the shooting pains in the limbs have gone.

After six injections she complains of occasional headaches and slight fever at intervals (*vide* chart). As this patient has shown a somewhat general reaction 1 c. c. of Ketyn has been given on the date of last injection. She states that she can now close her fingers with ease, which she could not do before, but the contraction of the flexors still persists. On the whole, she thinks she feels better and previously she used to have a heavy feeling, which has since disappeared. Her appetite has also improved.

**Case 6.**—Khristochit, son of Kaliram, *aet.* 22, caste Mohata, of village Pooncha, Purulia, Manbhum.

*Previous history.*—He states that his mother was affected with leprosy but no other relatives. Some three years ago he noticed that he had no sensation in the right leg up to the knee and then an ulcer developed over the lower third of the outer side of the right calf and remained for three months. He then had ulcers on the right hand more especially on the little finger—this finger has now become bent at the first phalangeal joint and is enlarged and somewhat shortened. Afterwards he had shooting pains in right arm, and later an ulcer developed over the inner side of the left ankle and over the great toe of the left foot—these have now healed.

There is now ulceration over the second toe of the right foot and the nail is gone, whilst all the toes are swollen and the nails are much atrophied.

His face is of the typical "leonine" expression and shows marked lepromatous nodules over the nose, both cheeks, and the lower jaw, but not so marked over the eyebrows, which still retain their hair. The lobes of both ears also show marked thickening.

Treatment was begun on 30th September with Nastin B, and after five injections, not only has no improvement been noticed, but two fresh ulcers have appeared on the sole of the left foot, another on the second toe of the right foot. In this case, though apparently a very suitable one for the injection of Nastin B, yet so far there has been no apparent benefit in his general condition and no improvement as regards sleep nor appetite.

**Results of the experiment up to 3rd November 1909.**—As in Captain Williams' Report, I propose to discuss the results of the treatment with Nastin B under the following heads:—

- (1) General health.
- (2) Lepromata and ulcers.
- (3) Anæsthesia.
- (4) The temperature charts.
- (5) General remarks.



In doing so I presume that Professor Rogers will do full justice to the microscopical changes in the tissues, and I will therefore confine myself to the clinical side of the picture.

(1) *General health*.—Four of the six cases show a marked improvement in general health from the commencement of the treatment; they have slept better and the general feeling of lightness together with an improved appetite have been the chief factors in the improvement of their general health.

Case 2 would have improved also had he not been attacked with malaria and even though he feels weak, yet he feels better than before, whilst case 6 though showing no improvement, yet at the same time does not show any deterioration in health.

(2) *Lepromata and ulcers*.—With the exception of case 6 the lepromata and ulcers have shown a steady improvement from the beginning, but whether or not this improvement is permanent, time alone can tell. Case 6, Khristochit, has however resisted the treatment and even developed fresh lesions, viz., two ulcers on the sole of the left foot and one on the second toe of the right. I have hopes, however, that in this case ultimate improvement will take place and believe that the ulcers in question are merely the expression of a reaction within a leprosy nerve centre and giving rise at the periphery to a purely tropic disorder.

In the other cases, a local reaction occurs at the seat of the lepromata causing a breaking down of the nodules at their periphery, and so long as there is sufficient Nastin present in the blood to keep up the action of the Benzoylchloride, then the process of softening continues and the lymph channels and the vessels are able to absorb and throw off the fatty products resulting. If, however, there be not sufficient Nastin present in the blood to carry the Benzoylchloride to the leprosy nodules, then no action will result. If, on the contrary, the Nastin be in excess or of excessive strength then too much Benzoylchloride is conveyed to the nodules, and if these cover a large surface as, e.g., the whole of the face, then not only a local, but a general reaction results and the vessels are unable to absorb the resulting products. Such a condition may be compared with the absorption taking place from a raw surface such as a deep burn covering an extensive area. The action of the Benzoylchloride in the presence of Nastin acts on the fatty envelope of the bacilli resulting in a product which, if absorbed, acts as a toxin and produces along with the bacteriolysis a general as well as a local reaction, and therefore Deycke is right in stopping the injections of Nastin B in such cases. Deycke states that Nastin B "is thoroughly effective in therapeutic respects and produces, in my opinion, better results in the long run than any reactive solution. I would expressly accentuate this point because again and again there arises the mistaken idea that without visible reaction no therapeutic effect was obtainable."

It is for this reason also that Deycke lays down the law regarding suitable cases and the time for injection, viz., that whilst Nastin B<sub>1</sub> is the standard solution, it is suitable for cases of the ordinary "mixed" type, in whom the disease has not advanced too far, and when given at regular intervals of, say, one week.

I have satisfied myself that Nastin B<sub>2</sub> should only be employed in nerve leprosy and even in these cases it must be used with caution and each case treated on its merits. Case 5, for example, shows a slight general reaction throughout, and though a general improvement has taken place, yet the fact remains that sufficient time should be allowed to lapse between the injections to allow of complete absorption of the products.

I have not hitherto had any experience of the action of Nastin B<sub>3</sub>, as its use was prohibited in my cases, but this is being kept in view and will be reported on later.

Almost all the patients complained of an itchy feeling at the seat of leprosy nodules and could not refrain from scratching them. I am satisfied that Nastin B has a specific action on the leprosy nodule.

3. *Anæsthesia*.—For the purpose of depicting in a graphic manner the effect of treatment with Nastin B, I have had prepared a chart of each patient showing the anæsthetic areas before treatment and again those present on the date of this report (3rd November).



It may be stated generally that excepting case 6, Khristochit, all the cases show some improvement as regards anæsthesia and case 3, Masidhoni, even during the last two months, shows an almost complete disappearance of the anæsthesia as a result of the treatment.

4. *Temperature charts.*—These are exceedingly interesting and show in addition the number of pulse beats per minute.

One feature should be noted and that is that whilst it is advisable not to have a general reaction with fever in these cases, yet in those in which a slight general rise persistently took place, it did not seem to militate against the progress of the patient and the general health of the patient continued to improve; this is well seen in the charts of cases 1 and 3.

(5) *General remarks.*—All the cases of this series were confirmed by microscopical examination of a smear of mucus obtained from the nose and stained by the Ziehl-Neelson method. (Slides sent herewith.)

In judging of the action of Nastin B in the treatment of leprosy it must not be forgotten that severe symptoms may be much ameliorated by the patient being placed under good hygienic conditions, and that periods of exacerbation and quiescence are the rule. Therefore it is necessary to have prolonged observation of at least six months before one can say definitely that Nastin B really effects a cure, and that any improvement produced by the injections is or is not of a permanent nature and not a mere transitory one.

It is also possible that some of the known remedies for leprosy, such as Cheulmoogra, &c., may assist the action of the Nastin and contribute towards the general improvement; this, however, has yet to be determined, viz., what remedy, if any, will be found most useful in this respect.

This report is incomplete, as it is not possible in the time at my disposal, viz., two months, to give more than a sketchy article on the progress made during that period; I have therefore called this a "preliminary" report. Up to the present the results have been encouraging, and time alone can show further developments.

Professor Deycke says:—"Generally, however, medical attendants and patients will be wise in being prepared for a long continued, I might say, chronic treatment; in practice, I would recommend to give it the character of an intermittent treatment, continued for years on the lines of antisyphilitic cures."

It therefore appears premature to dogmatise on the results of treatment after two months' observation, but even during this time I am satisfied that Nastin B constitutes a real advance in combating that most persistent of diseases—leprosy.

Having fulfilled the conditions laid down in Deycke's postulates, one can say that the effect of Nastin B has been to abort the leprosy process going on in the body and removed at the same time a portion of the disease. It only now remains to note whether this improvement is permanent or not, but in any case it appears to me that in Nastin B we have a substance which after injection into lepers will undoubtedly prolong their lives.

In addition, we may in time by means of these injections and complete segregation in early cases hope to so abort the disease that the foci already formed will not have sufficient life to develop and by an intermittent course of treatment, the conditions will be so prejudicial to the foci that they will not develop.

Apart from the relief of suffering and probable extension of life, the fact of being able to allow lepers after thorough treatment to mix with the general population without fear of their being a source of the disease is a great desideratum.

SAMUEL ANDERSON, M.B., C.M., B. Sc.,

D.T.M. & H. (CAMB.), MAJOR, I.M.S.,

Civil Surgeon of Manbhum.

PURULIA,

The 3rd November 1909.



## DIRECTIONS REGARDING THE TREATMENT OF LEPROSY WITH NASTIN-B.

Pure Nastin is a bacterial fatty substance, viz., a crystallisable and neutral fat (ester of glycerine). Detailed information as to its manufacture, its theoretical importance and its practical application, is contained in our essay, published in the "Deutsche medizinische Wochenschrift" (1907, No. 3, Deycke Pasha and Reschad Bey).

Nastin-B is a combination of Nastin with Benzoylchloride ( $C_6H_5-COCl$ ), a well-known chemically very active substance, which in vivo and in vitro displays a fat-removing action on so-called acid-proof bacilli, a process which directly prepares these bacilli for further disintegration (bacteriolysis). This substance is effective in the living organism only when combined with the Nastin, whereas in vitro it deprives, for instance, tubercle bacilli directly and at once of fat and, as a consequence, of their "acid-proofness", which depends on the presence of fatty substances. In full accord with this view, Nastin-B has been found to greatly excel pure Nastin in respect of reliability and constancy of therapeutic results on the one hand, and with regard to elimination of the dangers arising from Nastin reactions, on the other hand. Hence it is only Nastin-B which, on the strength of our experience, is to be recommended for general practical use in the specific treatment of leprosy.

For therapeutical purposes Nastin-B is employed by way of injections of oily solutions of Nastin-B in definite concentrations, as follows:—

The injections are made hypodermically (the arm, the thigh, the infraclavicular fossae, etc.), and only into the subcutaneous fatty tissue, but not into the muscular system. For the injections the customary glass syringes, with glass-, metal-, or asbestos-pistons, may be used; syringes made from hard-rubber are to be avoided, as they do not stand keeping for a long time under ether. As very recommendable we name the so-called "Luer"-syringes with a platinum canula suitable for annealing.

The syringe and canula must be absolutely dry (anhydrous). Unless one prefers dry sterilisation in the hot air chamber, one had best clean the syringe, before and after using it, with anhydrous ether only and to keep it always in a hermetically sealed specimen glass under anhydrous ether, so that it is ready for use at any time. The presence of but minute quantities of water gives rise to the formation of hydrochloric acid, and, as a consequence, to abscesses and necrosis at the places of injection. An injection of Nastin-B, when properly applied, causes a transitory, burning pain, but does not give rise to indurations, abscesses, necrosis, etc., in a word, it does not bring about any local reaction of any kind whatever.

Nastin-B is supplied by the firm of Kalle & Co. Aktiengesellschaft at Biebrich-on-the-Rhine (chemical works) until further notice—put up in hermetically sealed glass tubes of 1 c. c.—in three concentrations differing as to the amount of Nastin, but not so as regards the amount of Benzoylchloride which is the same in all solutions.

The standard solution for use in the treatment of leprosy is Nastin-B<sub>1</sub>.

One begins the treatment by injecting a whole syringeful (1 c. c.); only in severe cases one applies 0.5 c. c. at the outset. At first one injection is given per week, subsequently every fifth day, or if required, one may go so far as to apply 2 c. c. once a week. But it is always better to proceed by degrees, because doing so is less risky. Nastin reactions (local and general) should not ensue at all if the Nastin-B<sub>1</sub> solution is employed; and they can only occur when injections are given frequently.

The Nastin-B<sub>2</sub> solution, however, in which Nastin is present in excess, is of more or less pronounced reactivity (more especially so if applied frequently), i.e., it may give rise to local inflammatory symptoms of the leprous tissue (consisting in simple softening of pulpy consistency, inflammatory oedematous swelling and infiltration, the forming of serous and hæmorrhagic vesicles, suppuration, necrosis, etc.)—as well as to general reactions (subjective feelings of discomfort, fever, rheumatoid and neuralgiform pains, and such like phenomena) whose extent and intensity naturally are subject to far-reaching fluctuations individually. The use of this solution is restricted, therefore, to cases with few and particularly persistent leprous formations.



Its use is prohibited :—

1. In the case of ophthalmic leprosy, in which Nastin reactions may, through clouding of the refracting media and secondary glaucoma, injure the faculty of vision in a higher degree than the ophthalmic leproma itself.

2. In the case of nerve-leprosy. Regarding this affection it has frequently been ascertained that evidently in consequence of inflammatory Nastin reactions in leprous nerve-centres there are caused direct trophic disorders of the skin, consisting in pemphigoid eruptions, scald-like, some of them deep-penetrating, ulcerations, etc.

Hence in the case of ophthalmic leprosy and *lepra nervorum* in the beginning a more diluted solution, the Nastin B<sub>0</sub>, should be injected at not too short intervals of not less than a week. Only later on a careful application of the standard solution Nastin B<sub>1</sub> may be recommended.

Should in the course of the treatment occur distinct general or local Nastin reactions, slight though they may be, it is imperative to discontinue the injections until these phenomena have completely disappeared. Otherwise there may ensue under absolutely incalculable circumstances very turbulent reactions which are directly dangerous to life. In the case of patients who from the outset react very pronouncedly to Nastin, one succeeds sometimes in lessening and shortening the too intense reactions of a general nature by means of injections of the solution K (also supplied, ready for use, by the firm of Kalle & Co. A.G. which contains only Benzoylchloride without Nastin, as this substance seems to simultaneously counteract the fever and the toxin.

Besides the specific treatment, recourse may be had, of course, to other therapeutic, especially to surgical measures, in order to accelerate the curative process. Still, in the interest of objective clinical observation, it is advisable not to resort too soon and—at first at least—not too extensively to such measures. In the further development of the affection, it is true, one will not be able in general practice to dispense with surgical or caustic measures for the removal of very resistive, extensive or disfiguring leprous formations in order to shorten the period of the curative treatment and possibly on account of facial disfigurement. It is only the galvano-caustic or the chemical-caustic treatment of the nasal membranes that can be absolutely commended from the outset in the interest of the patients.

Just a few additional general remarks: It goes without saying that immunizing treatment, such as the Nastin method, should only be resorted to in clinical institutions where the patients are kept under strict control. Irrespective of anything else, this is necessary because of the long duration of the treatment which in the case of a constitutional disease, such as leprosy, is bound to last for months and even years. I will not omit mentioning that occasionally it is advisable to suspend the treatment for a period of one to two months and even longer.

Leprous cases of the severest nature *i.e.*, cases in which the internal organs have been affected, in which anæmia of a high degree or pronounced cachexia exists, or in which other complications (in particular nephritis) have appeared, should from the very outset be excluded from the specific Nastin-B therapy. All the other leprous affections, however, are suitable for the treatment. In most of them the leprous process will be arrested, in many instances there will result a more or less pronounced improvement which in some cases approximates a cure.

In conclusion of these directions I would impress on readers the suggestion made in the above-mentioned essay regarding leprosy, namely: In the case of a specific therapy the medical attendant is more than ever dependent on careful clinical observation and estimation of every individual case. And yet one word more: The less one expects rapid and wonderful results, and the more one is able to control one's own and the patient's impatience, the better results will be obtained.



is not prohibited:

1. In the case of epistemic surgery, in which the patient is aware of the nature and extent of the operation, and the patient is in a position to give informed consent, the operation is not prohibited.

2. In the case of epistemic surgery, in which the patient is not aware of the nature and extent of the operation, and the patient is not in a position to give informed consent, the operation is not prohibited.

3. In the case of epistemic surgery, in which the patient is not aware of the nature and extent of the operation, and the patient is not in a position to give informed consent, the operation is not prohibited.

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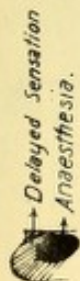
8. In the case of epistemic surgery, in which the patient is not aware of the nature and extent of the operation, and the patient is not in a position to give informed consent, the operation is not prohibited.

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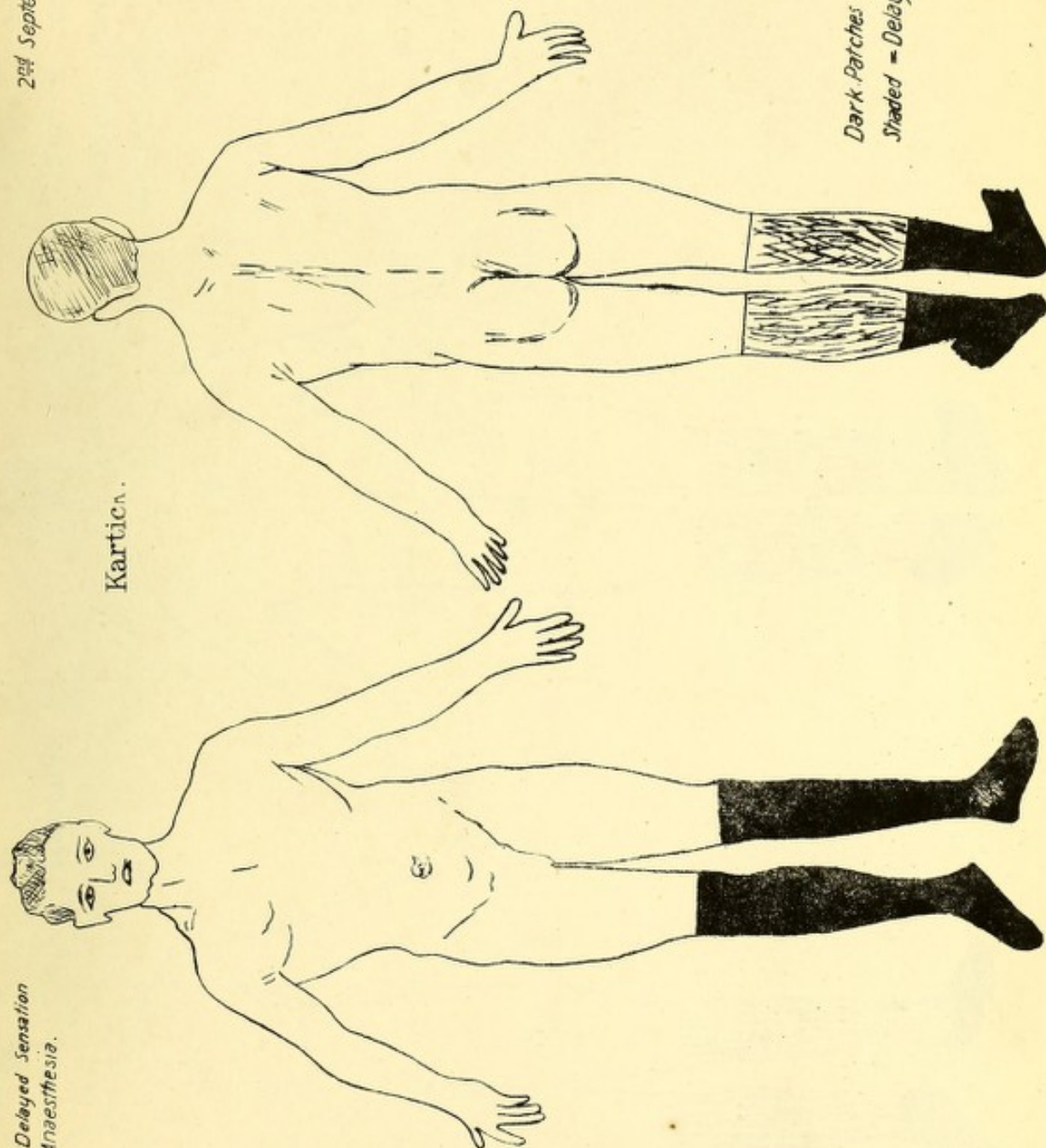


NASTIN-B. TREATMENT OF LEPROSY - PURULEIA LEPER ASYLUM. Case I

2nd September 1909.



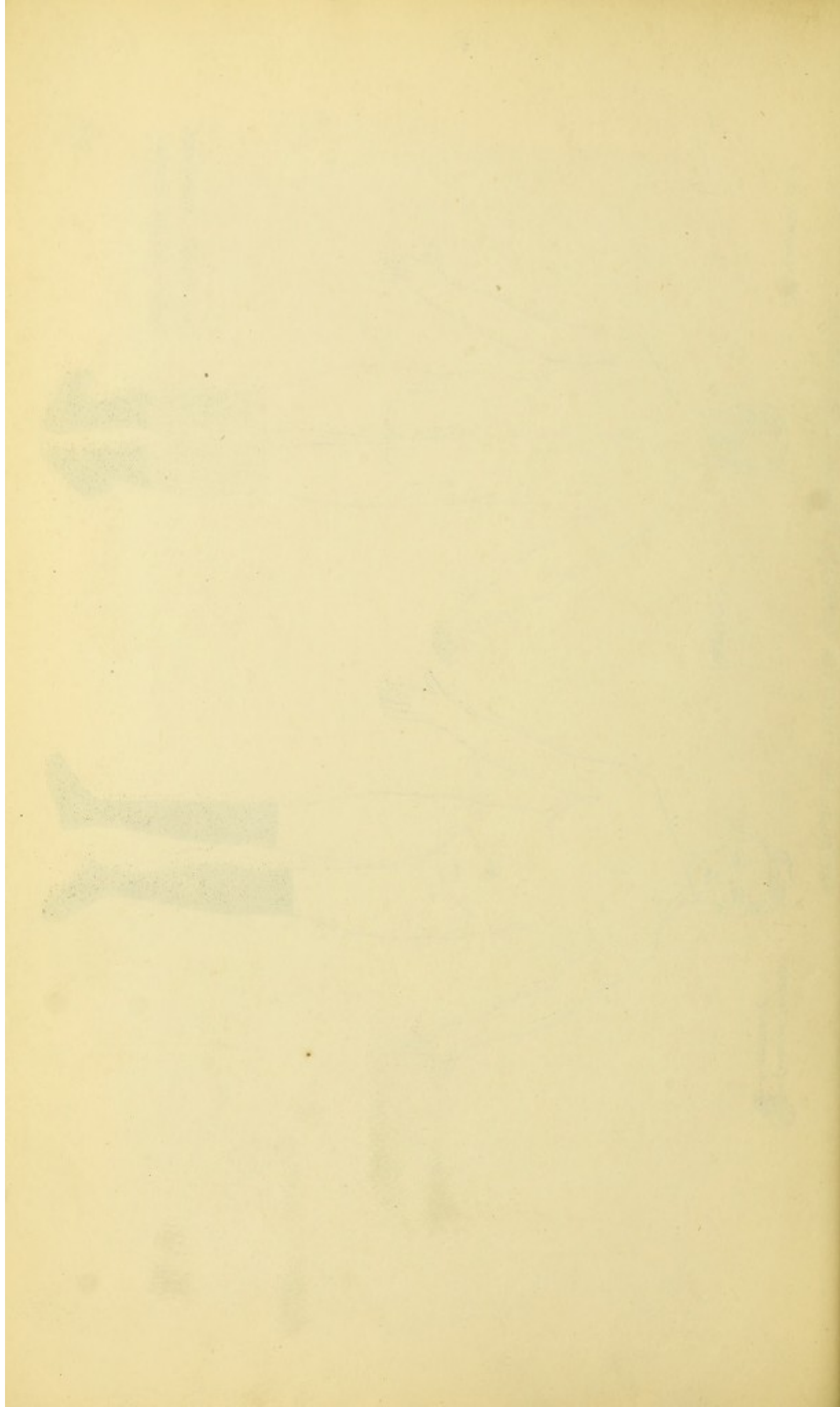
Kartien.



Dark Patches = Anaesthesia.  
Shaded = Delayed Sensation.

Fig.





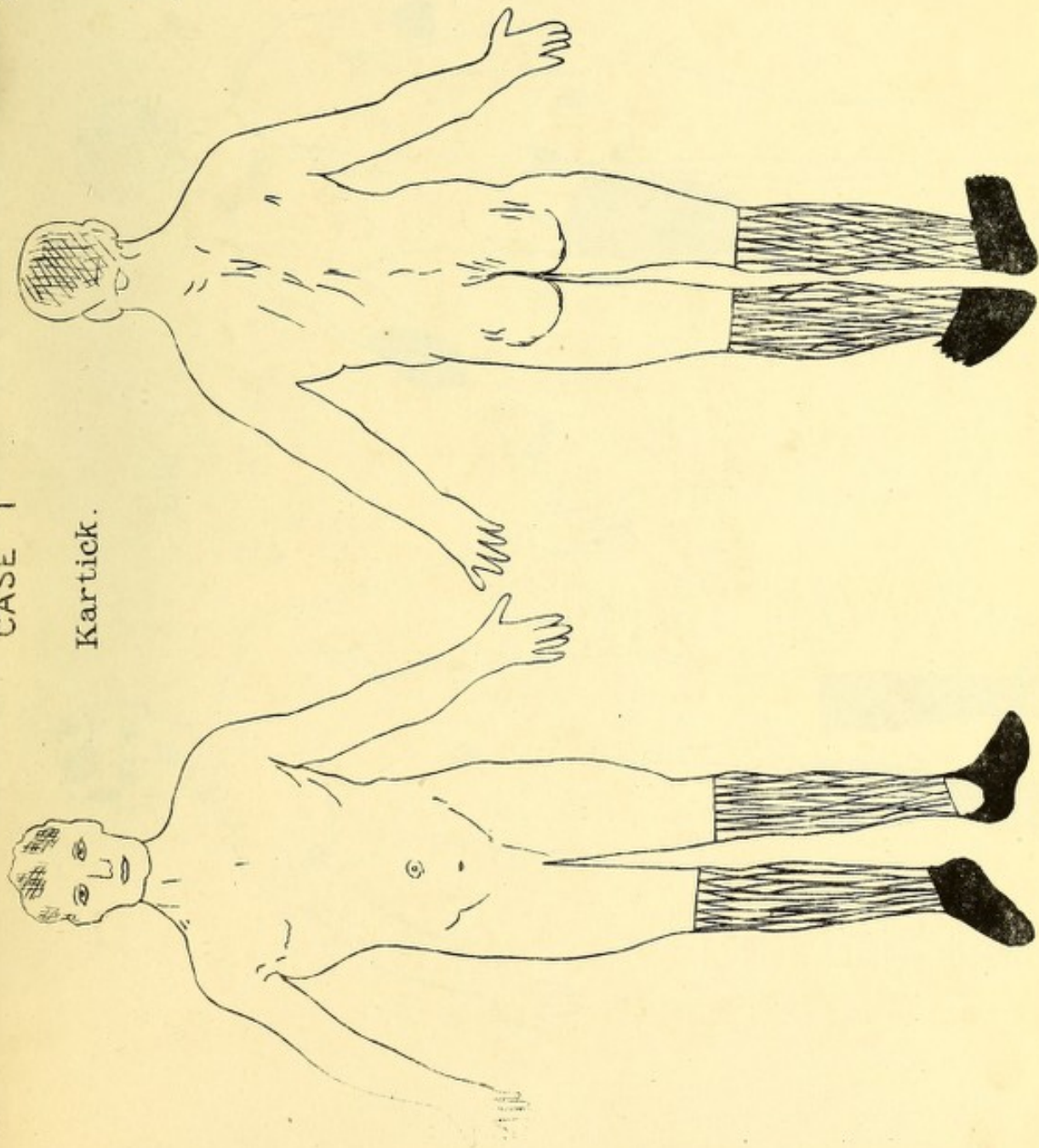


2<sup>nd</sup> November 1909.

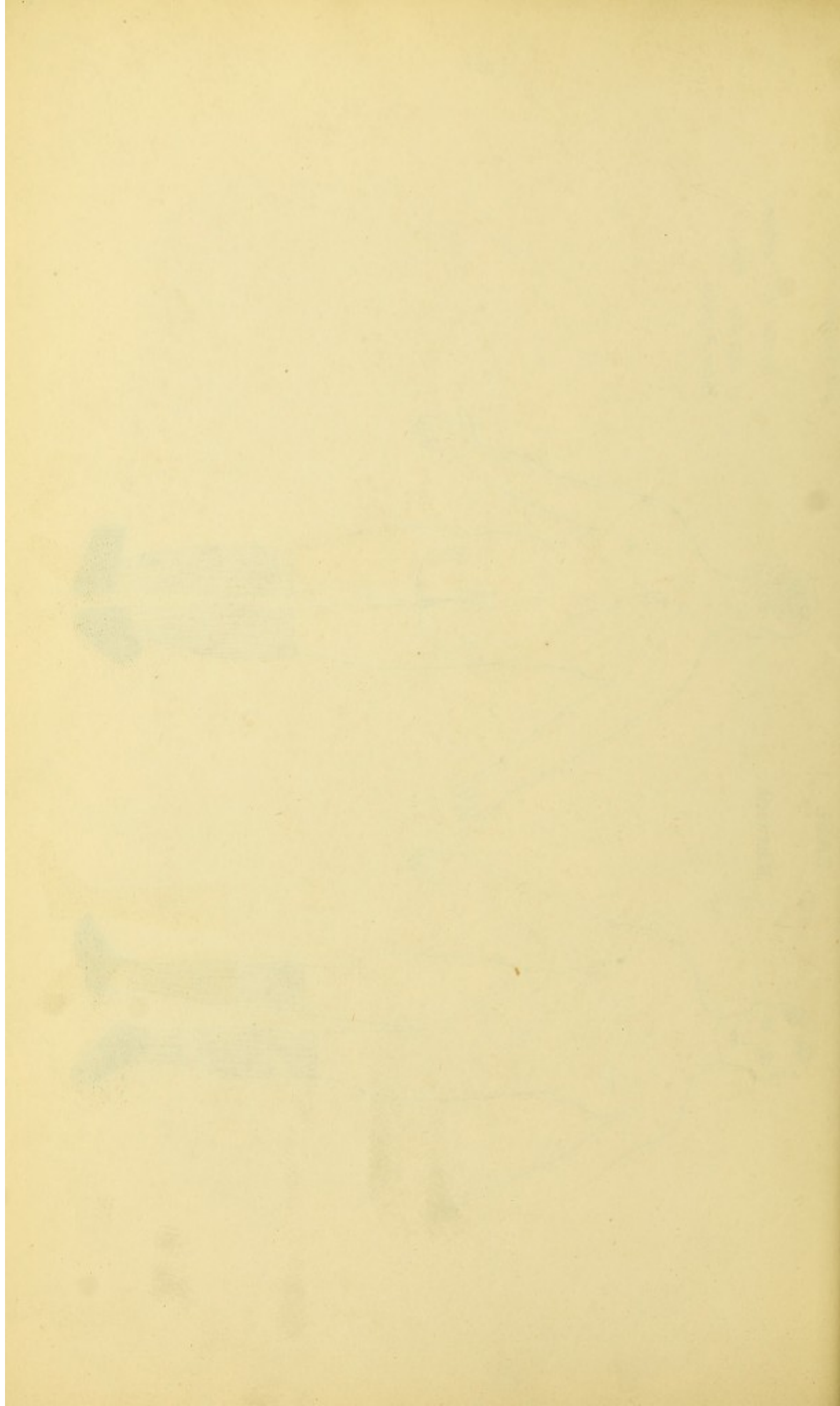
*Nastin - B. Treatment  
of Leprosy. Purulia  
Leper Asylum.*

CASE I

Kartick.



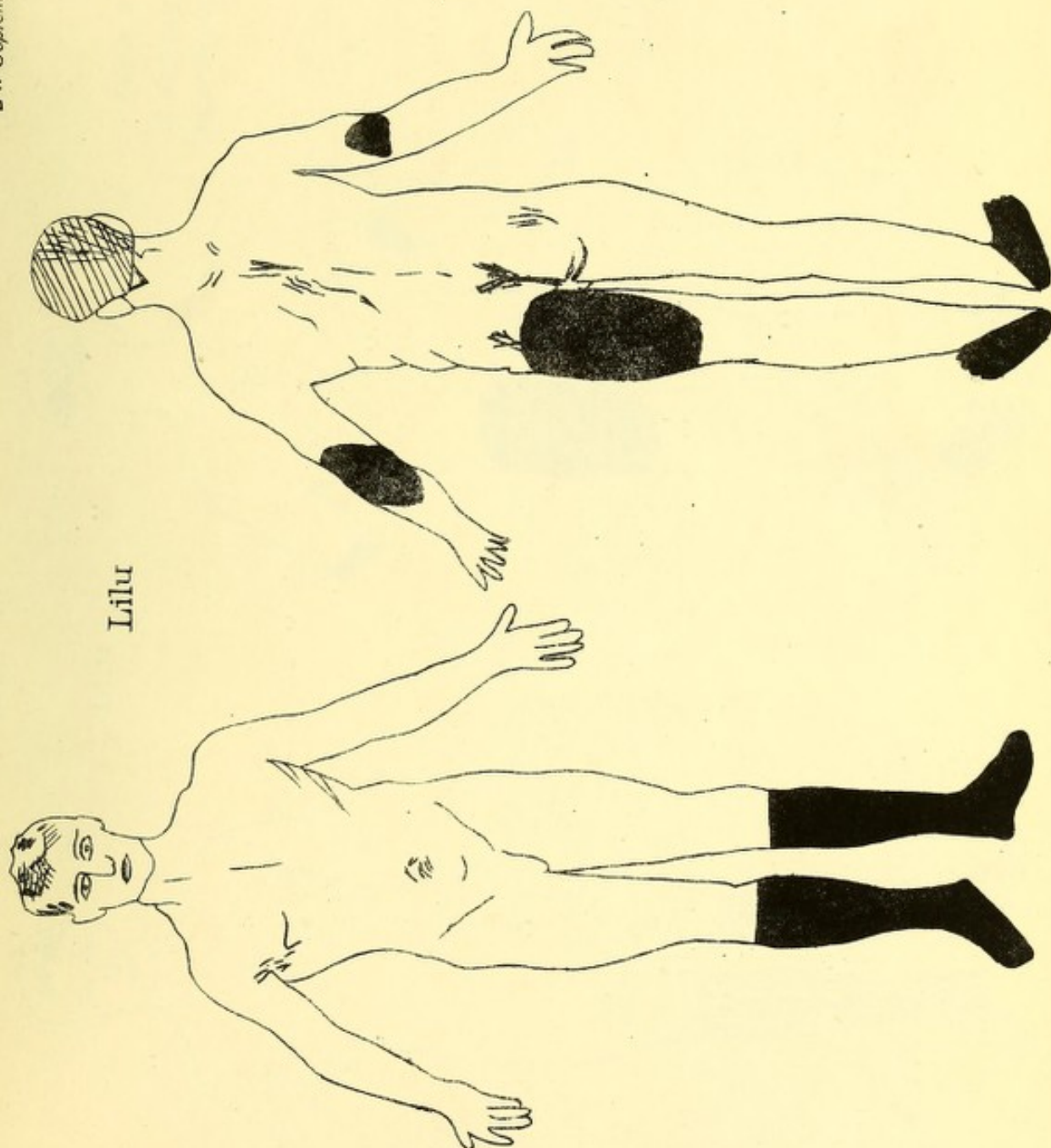




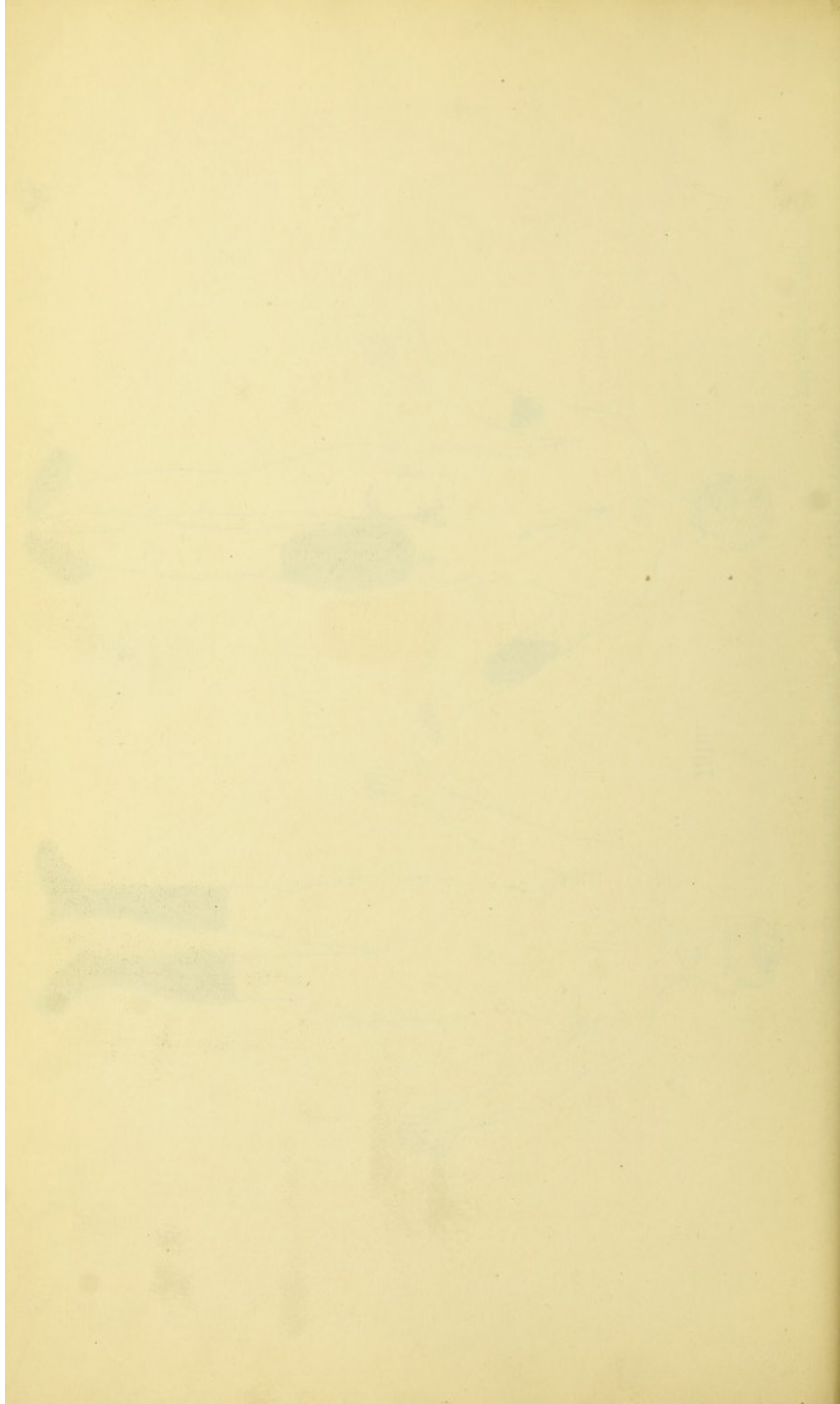


2<sup>nd</sup> September 1909

Lilu







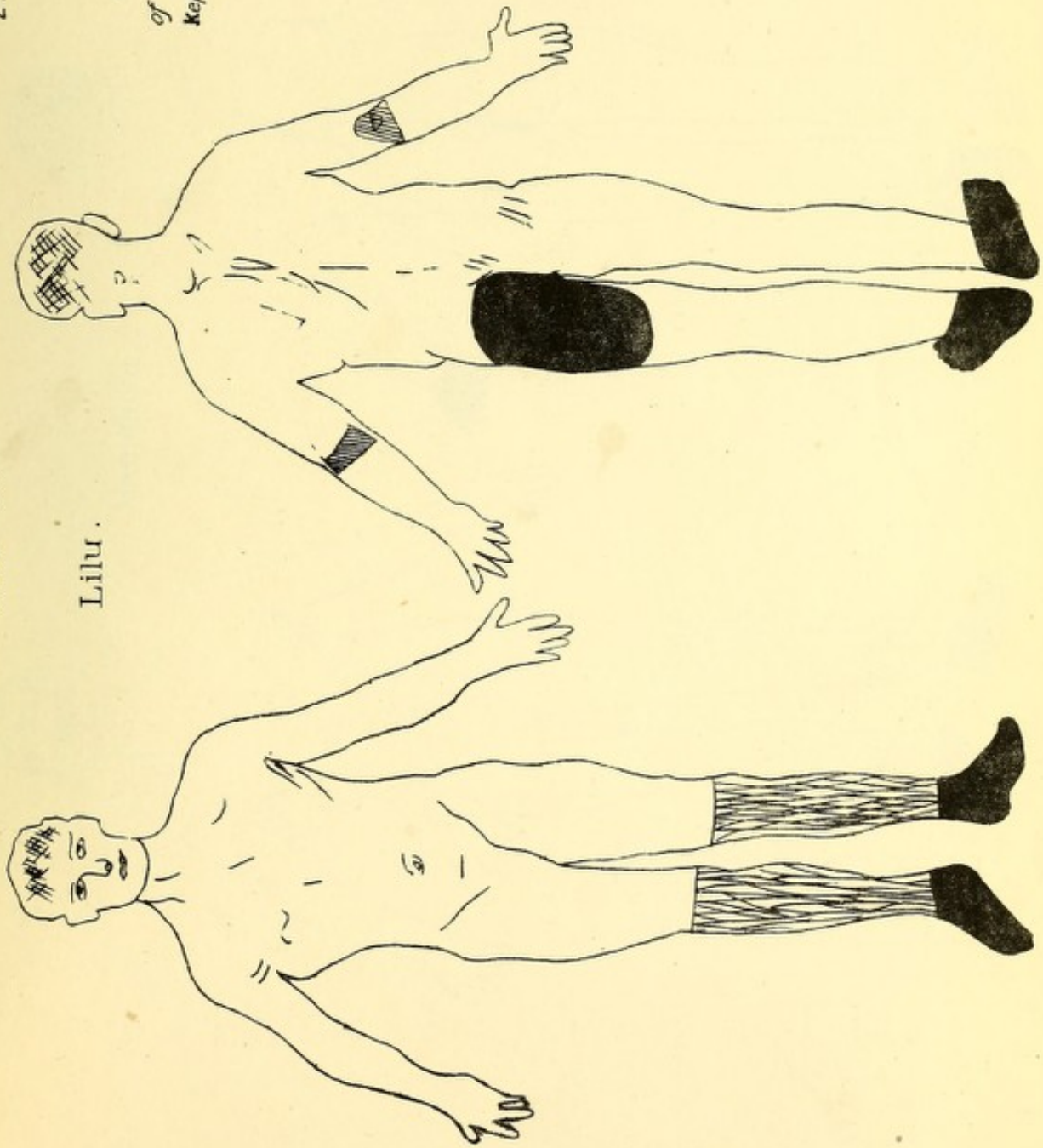


2nd November 1909.

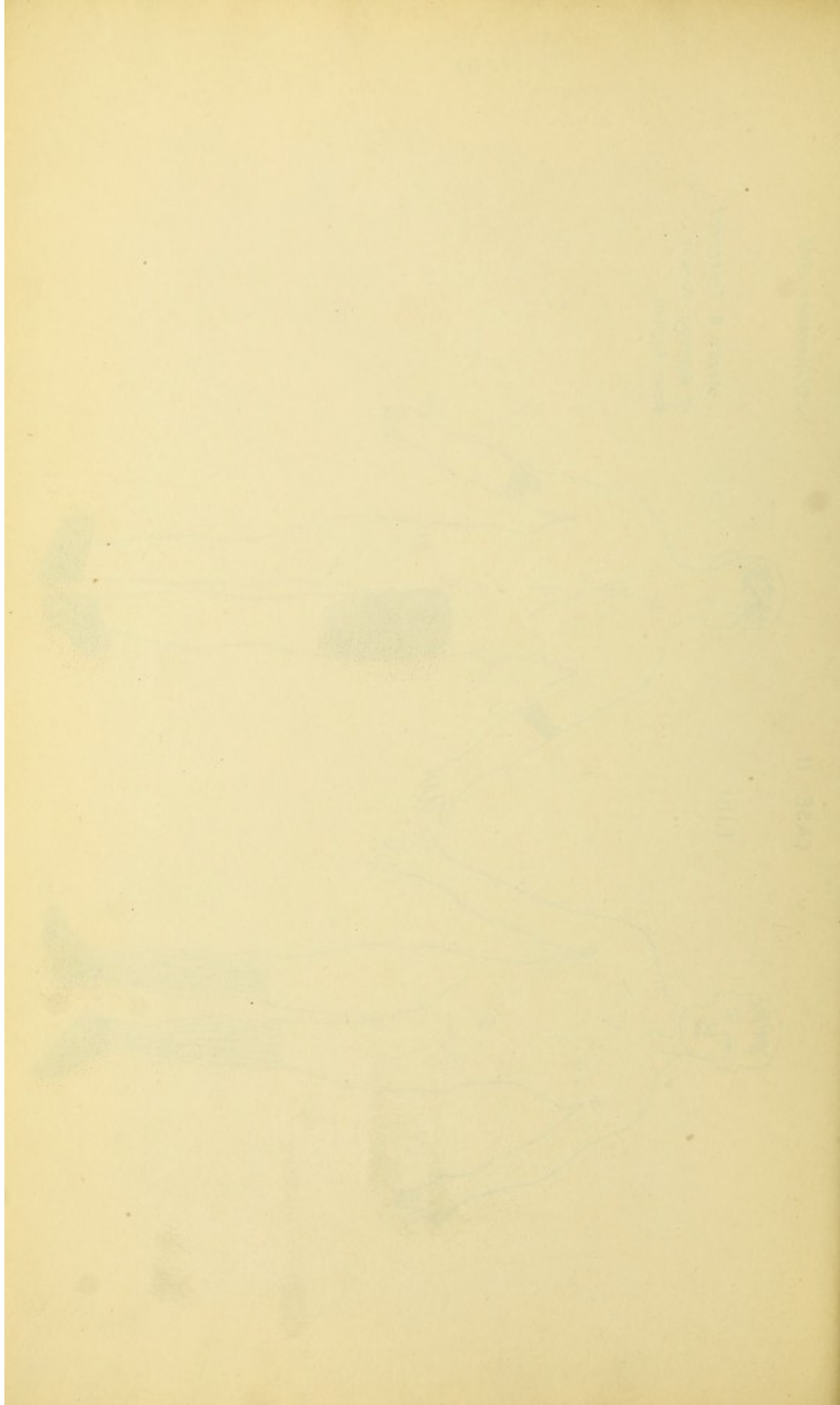
Nasim B Treatment  
of Leprosy. Purulia  
Keper Asylum.

CASE II.

Lilu.

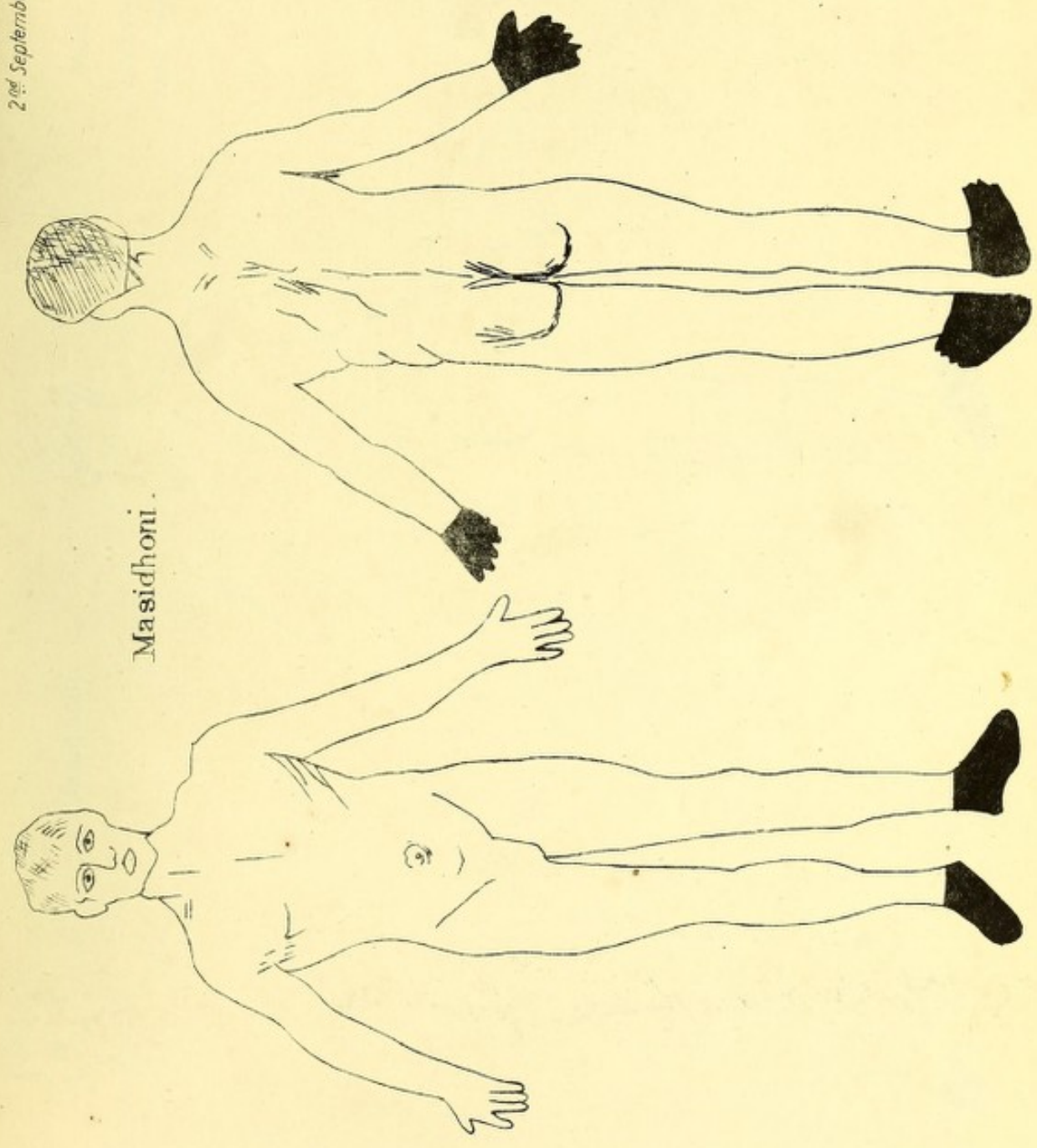






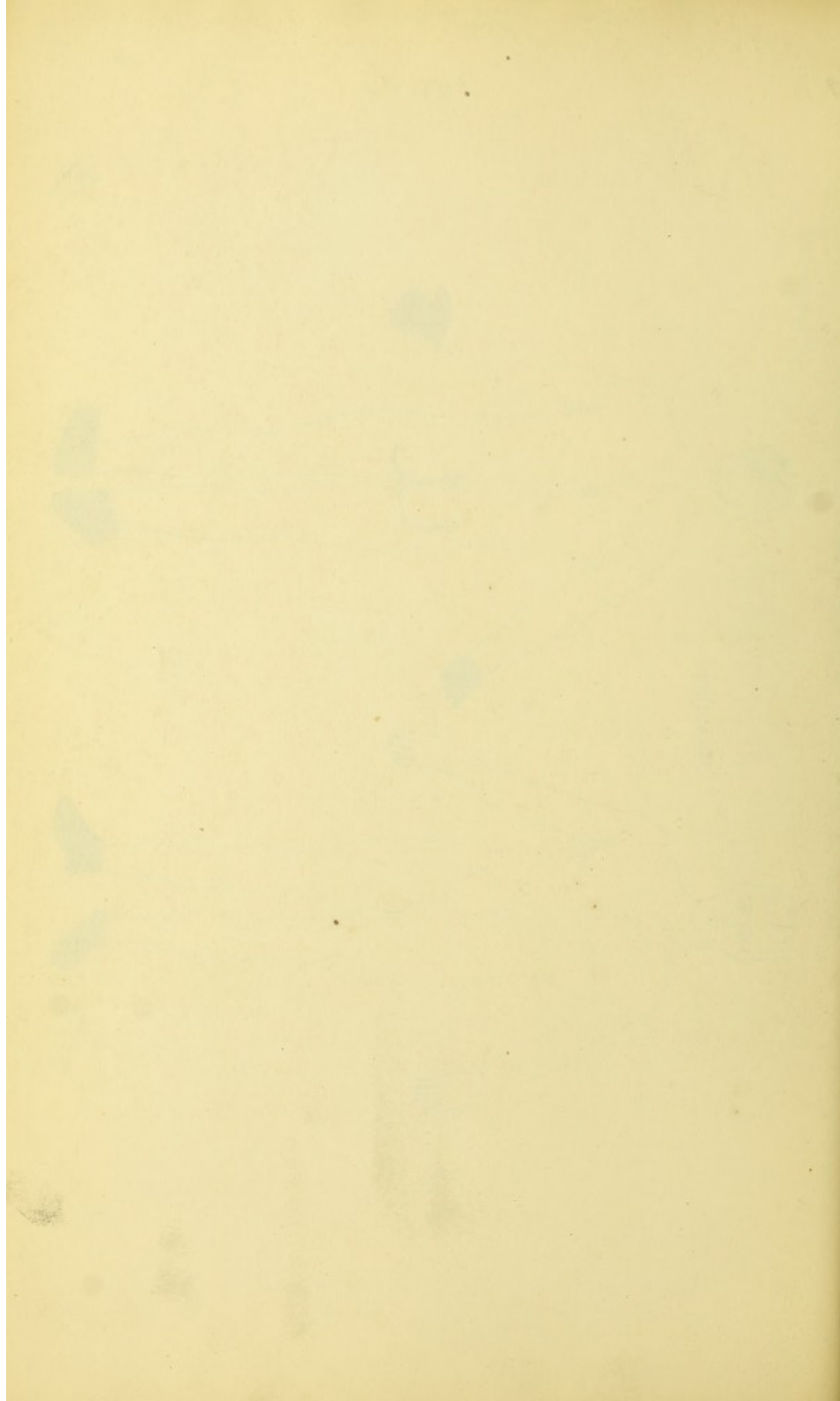


2nd September 1909



for







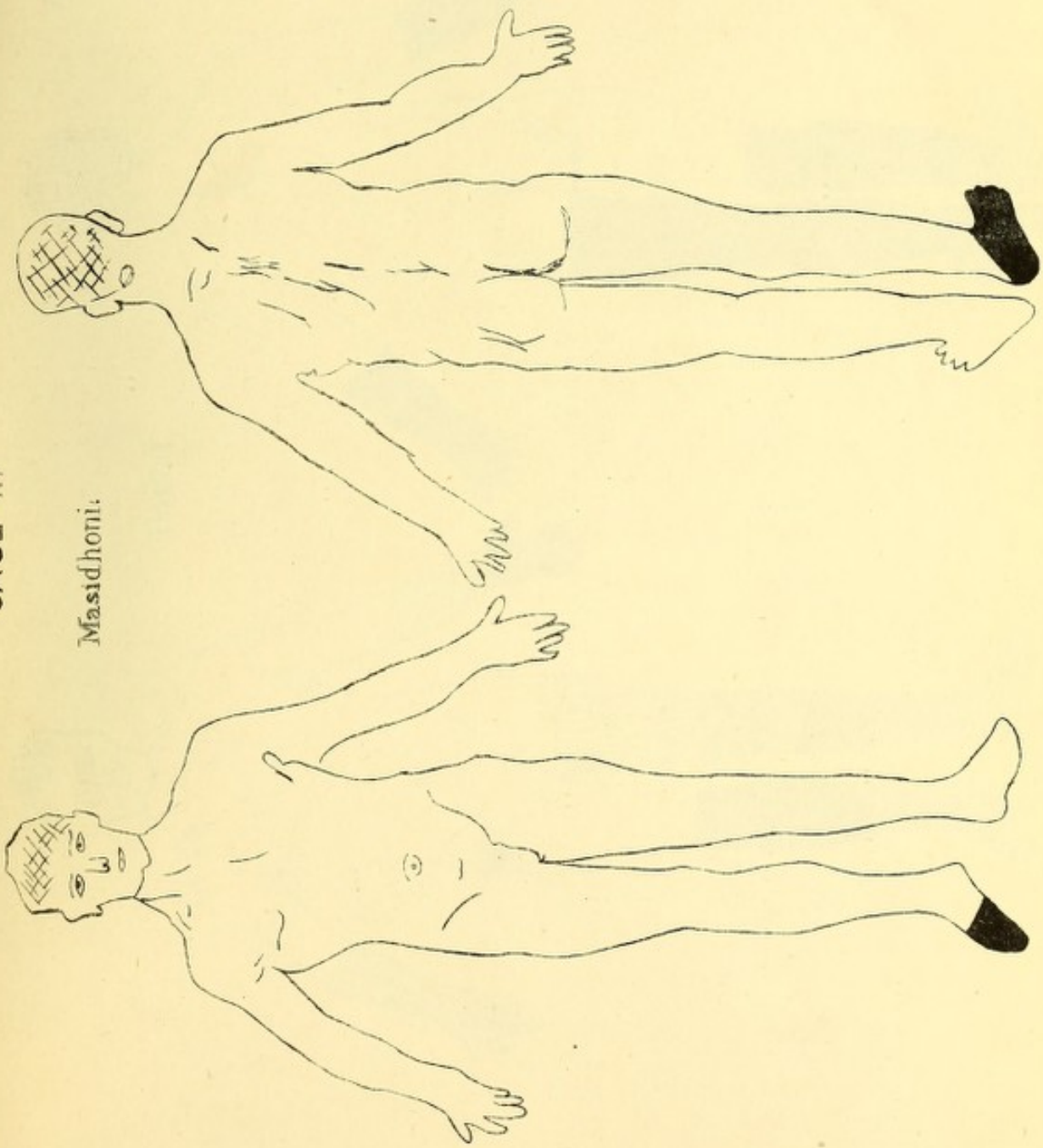
2nd November 1909

Nashin B. Treatment  
of Leprosy. Purulia  
Leper Asylum.

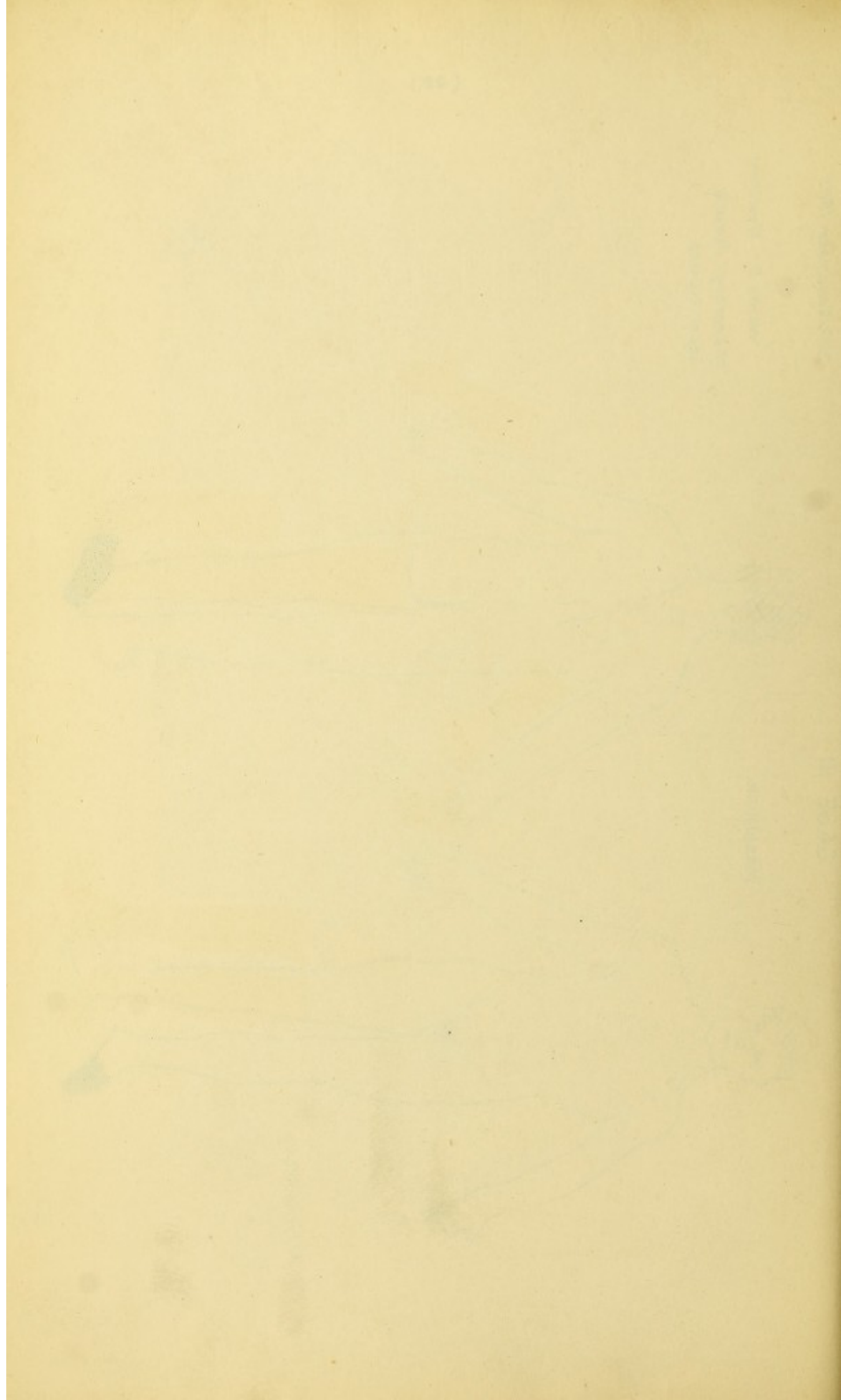
- 8/17

CASE III

Masidhoni.

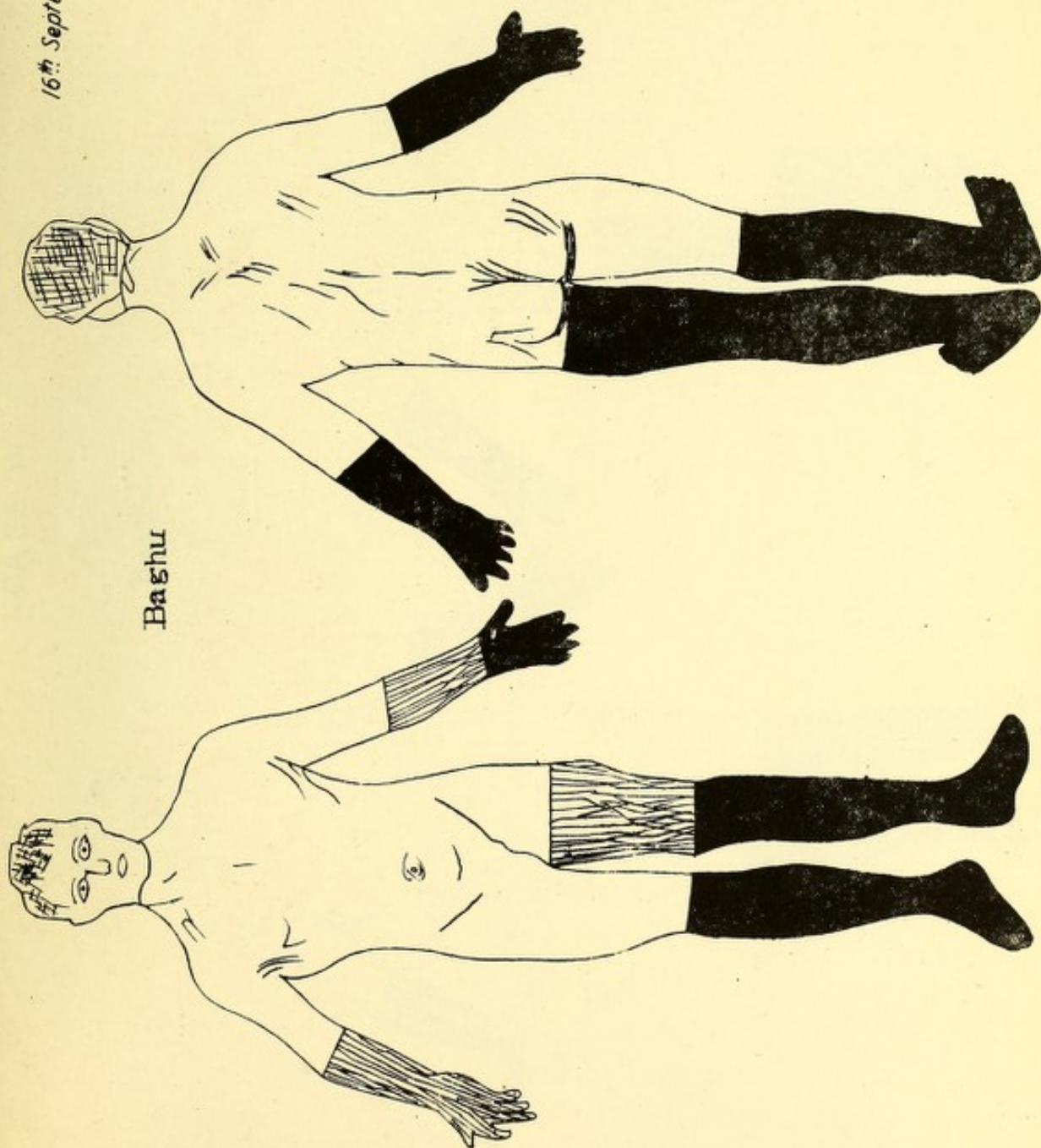






16th September 1909.

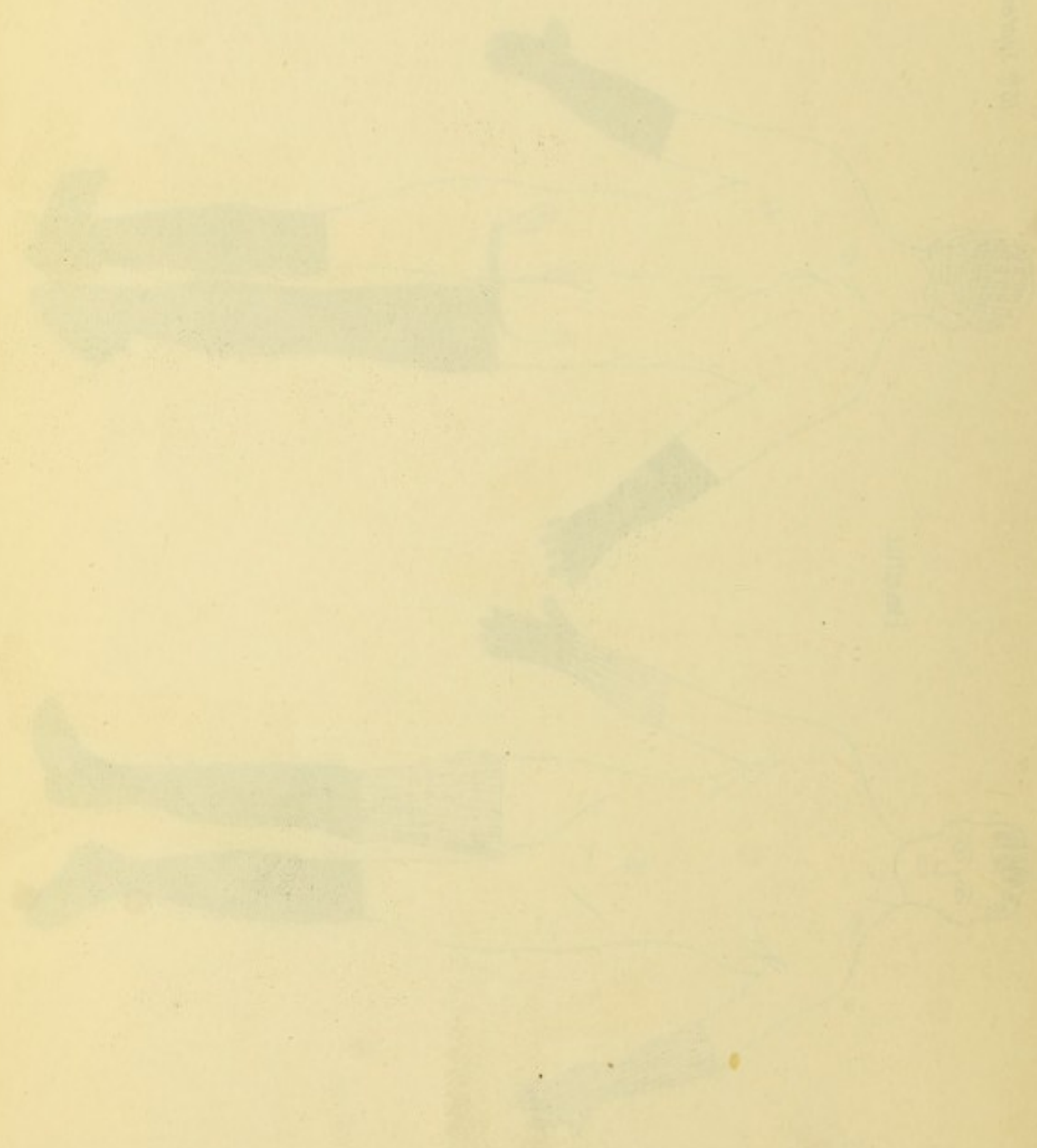
Baghu





12

12



CASE IV.

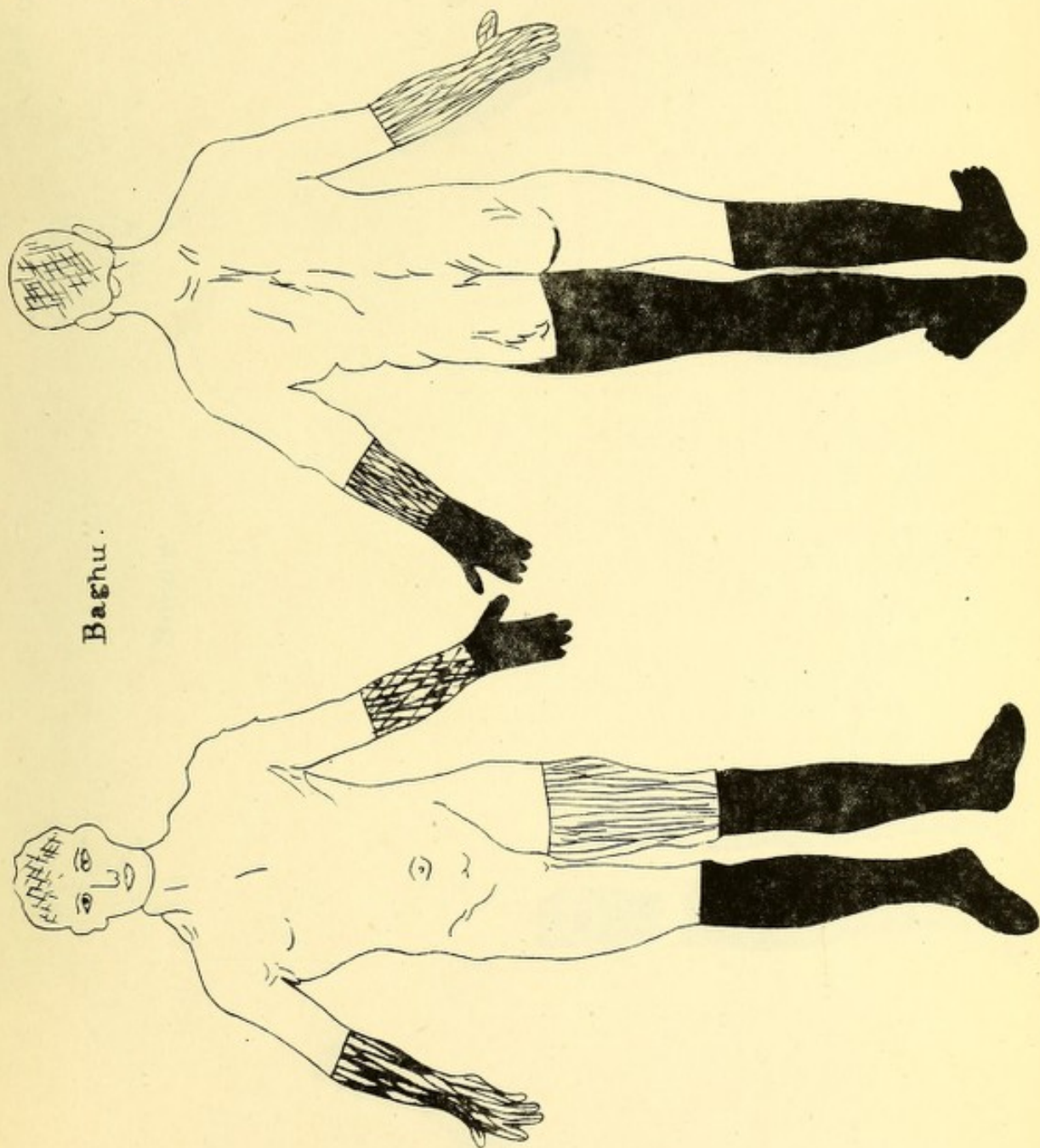
2nd November 1909.

Baghu.

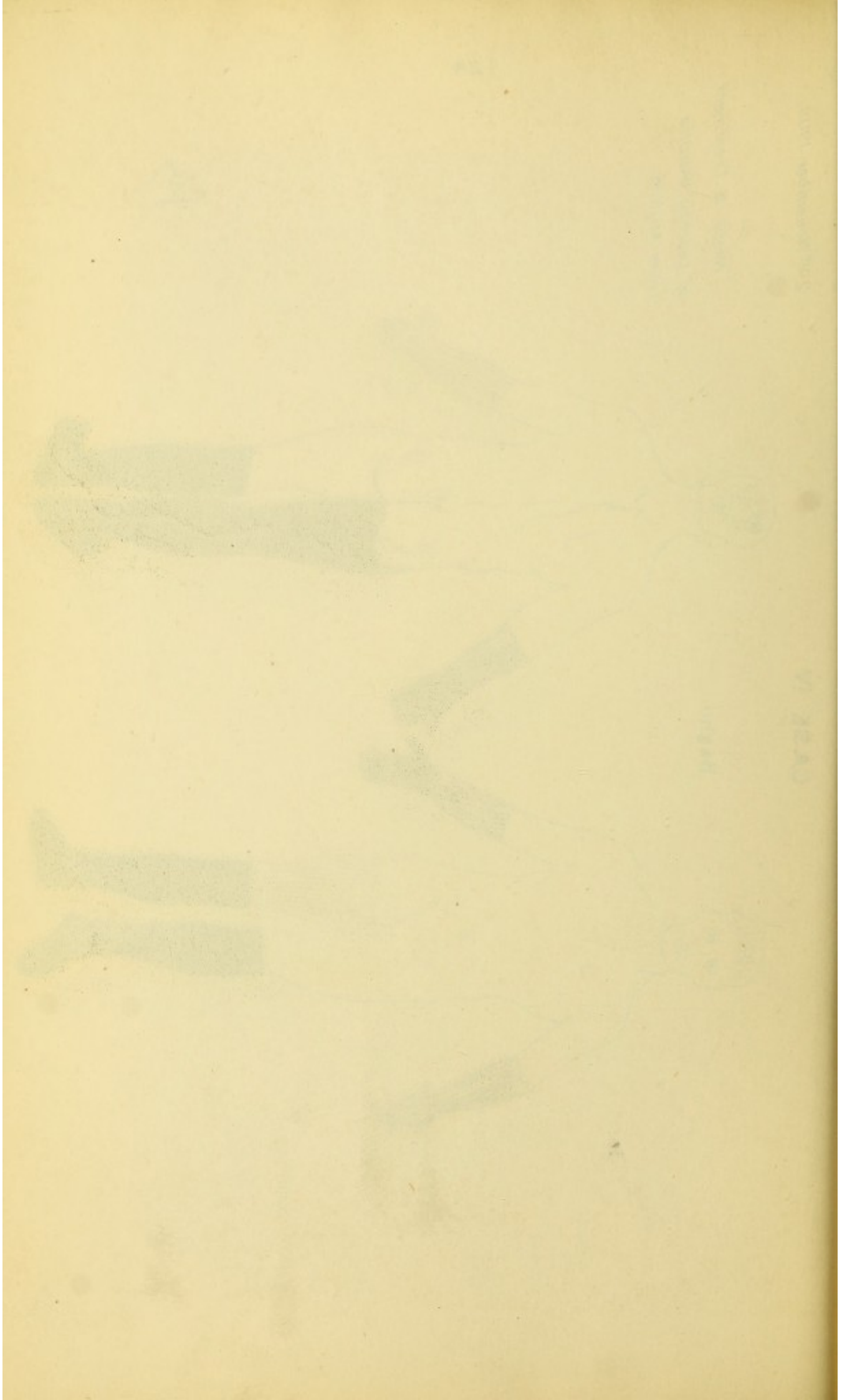
Naslin. B Treatment  
of Leprosy. Purulia  
Leper Asylum.

( 24 )

8/5

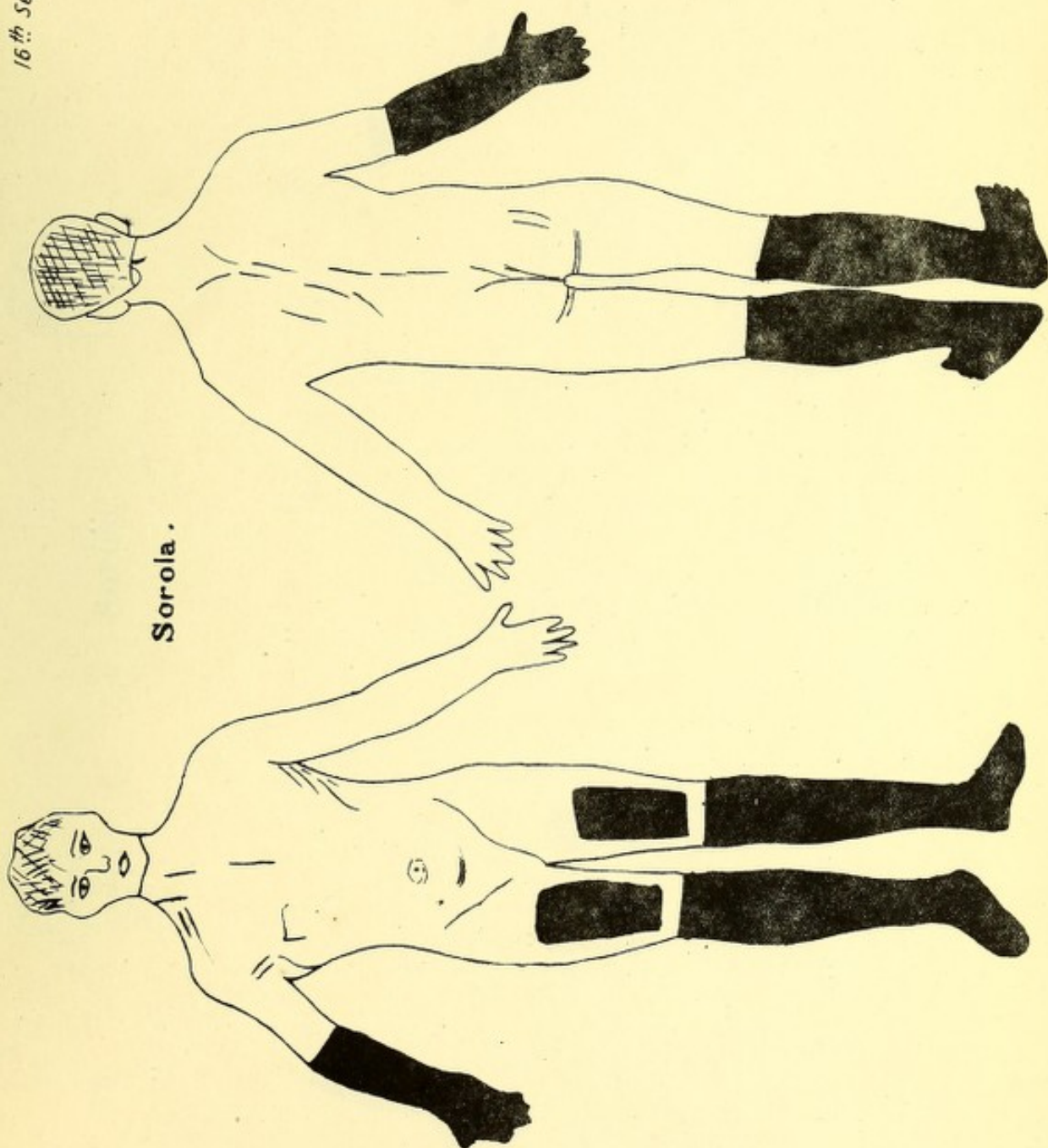




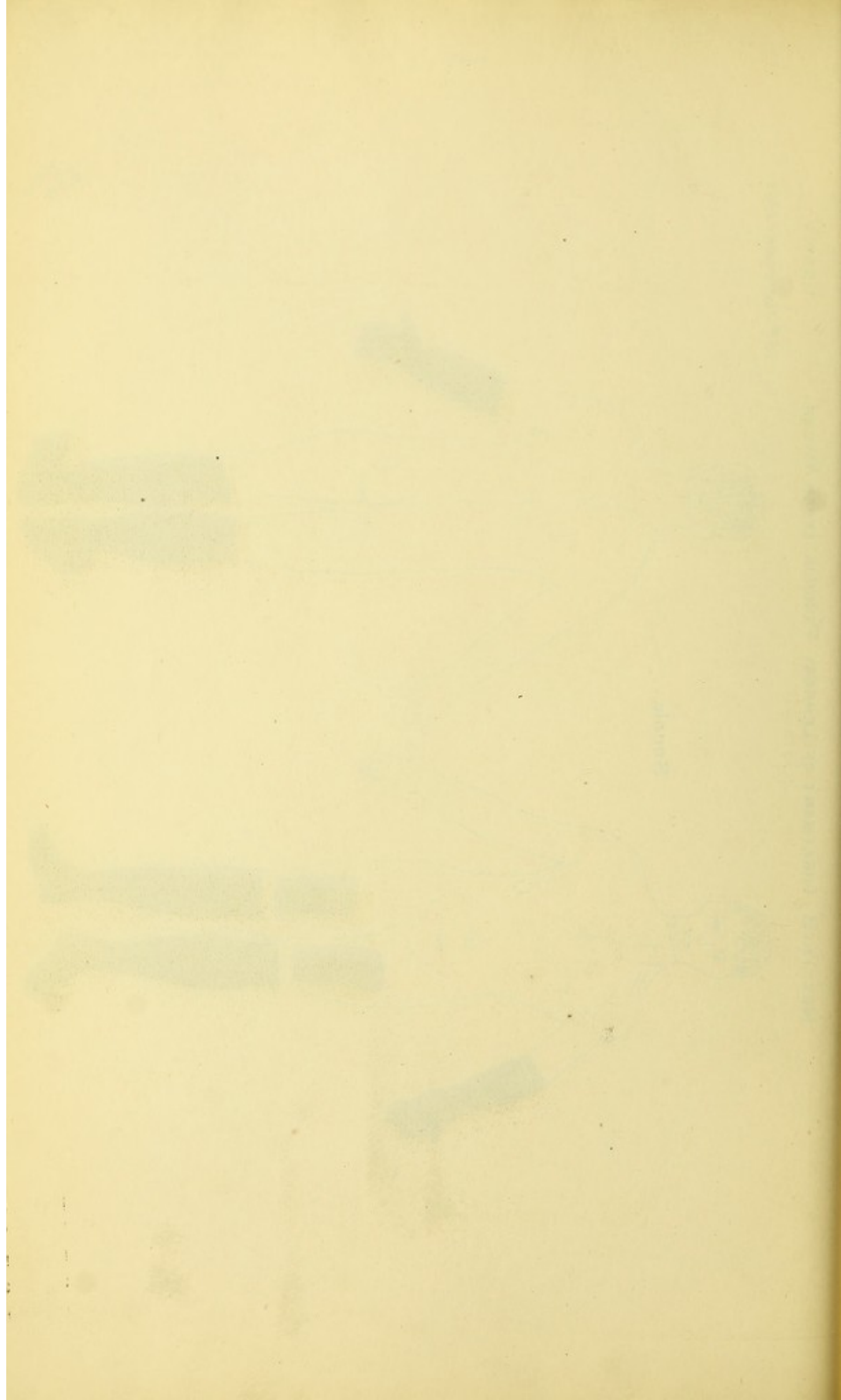


16<sup>th</sup> September 1909.

Sorola.







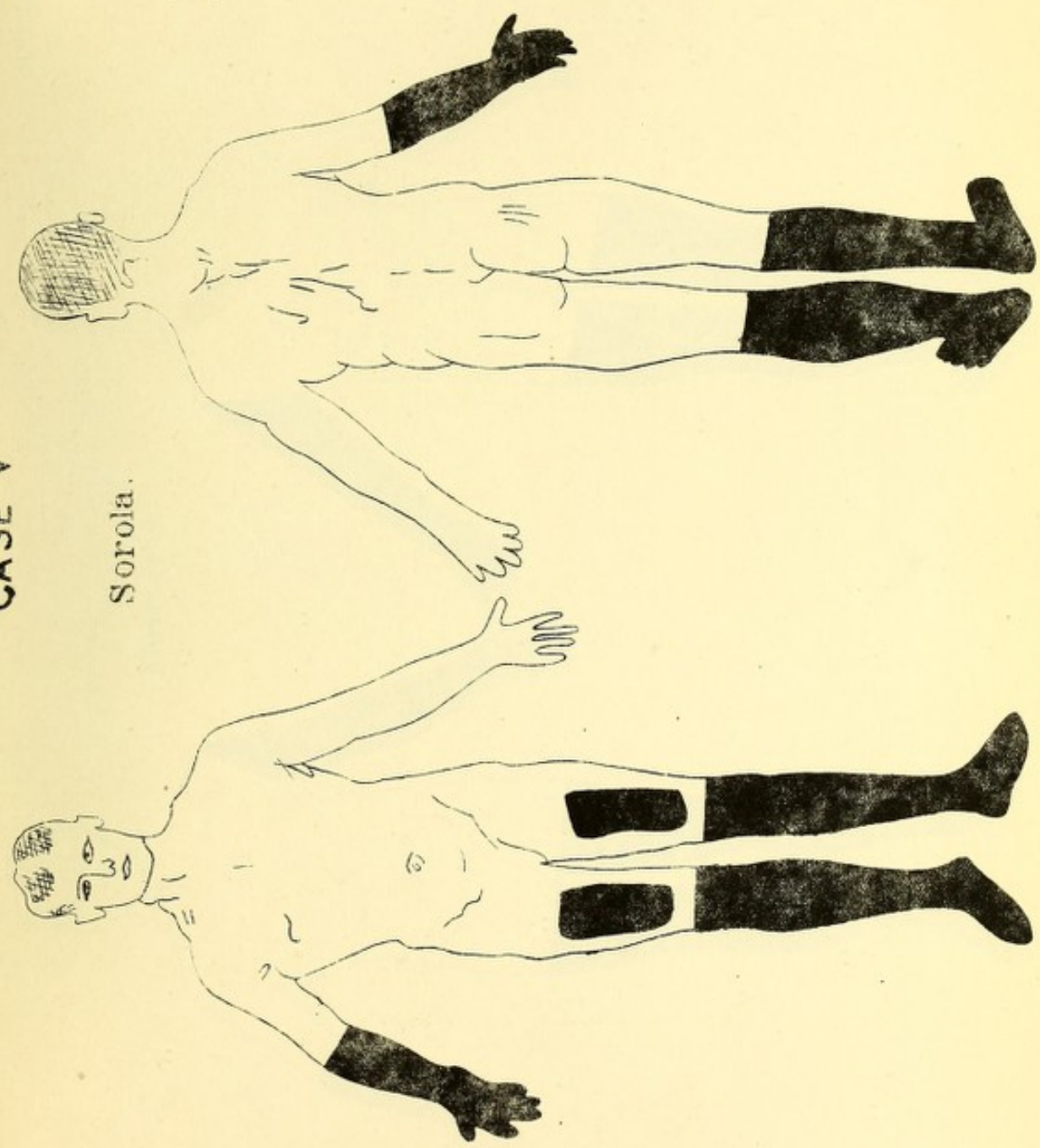
CASE V

Sorola.

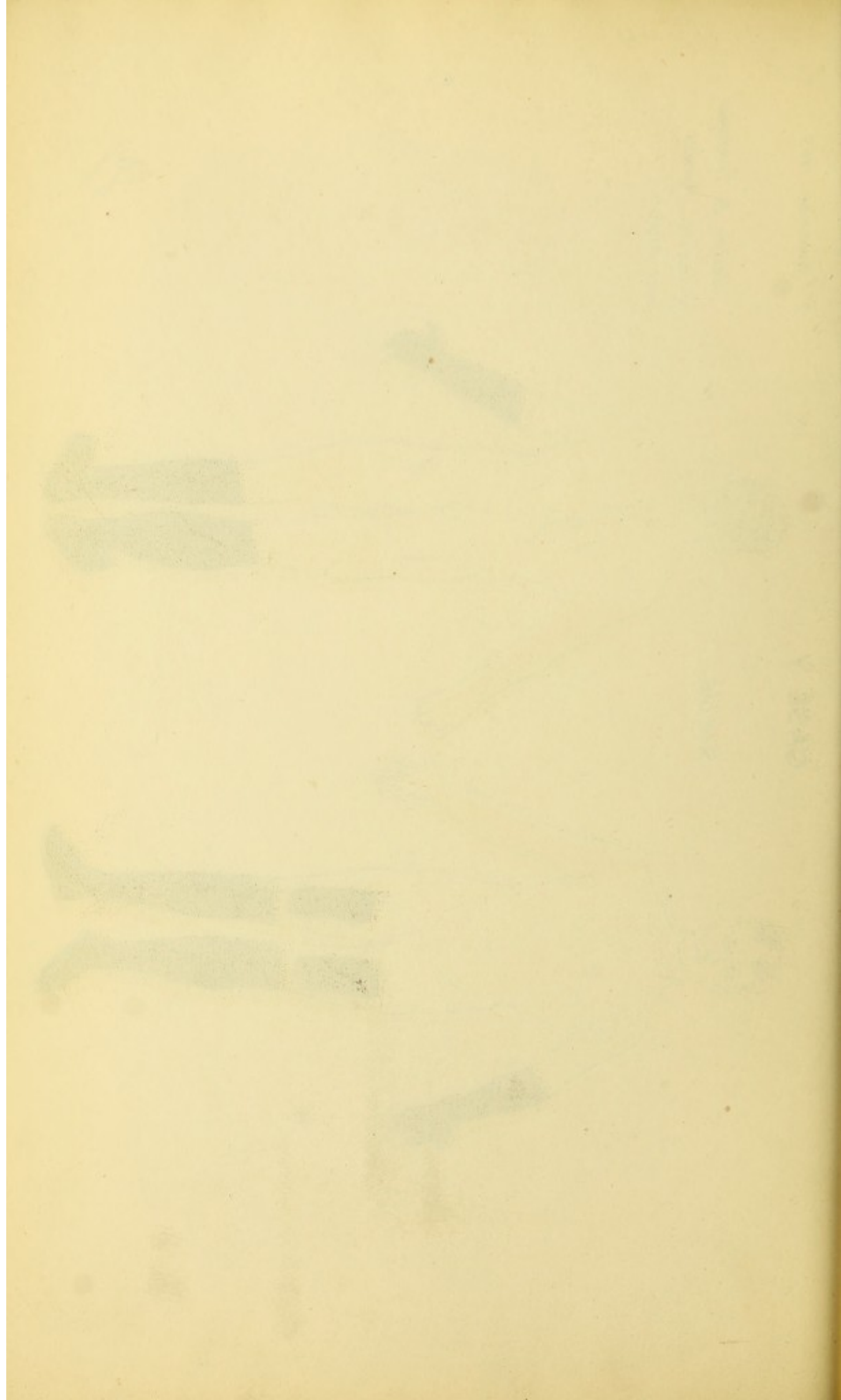
2nd November 1909

Nastin B. Treatment  
of Leprosy Purulia  
Leper Asylum.

Fig





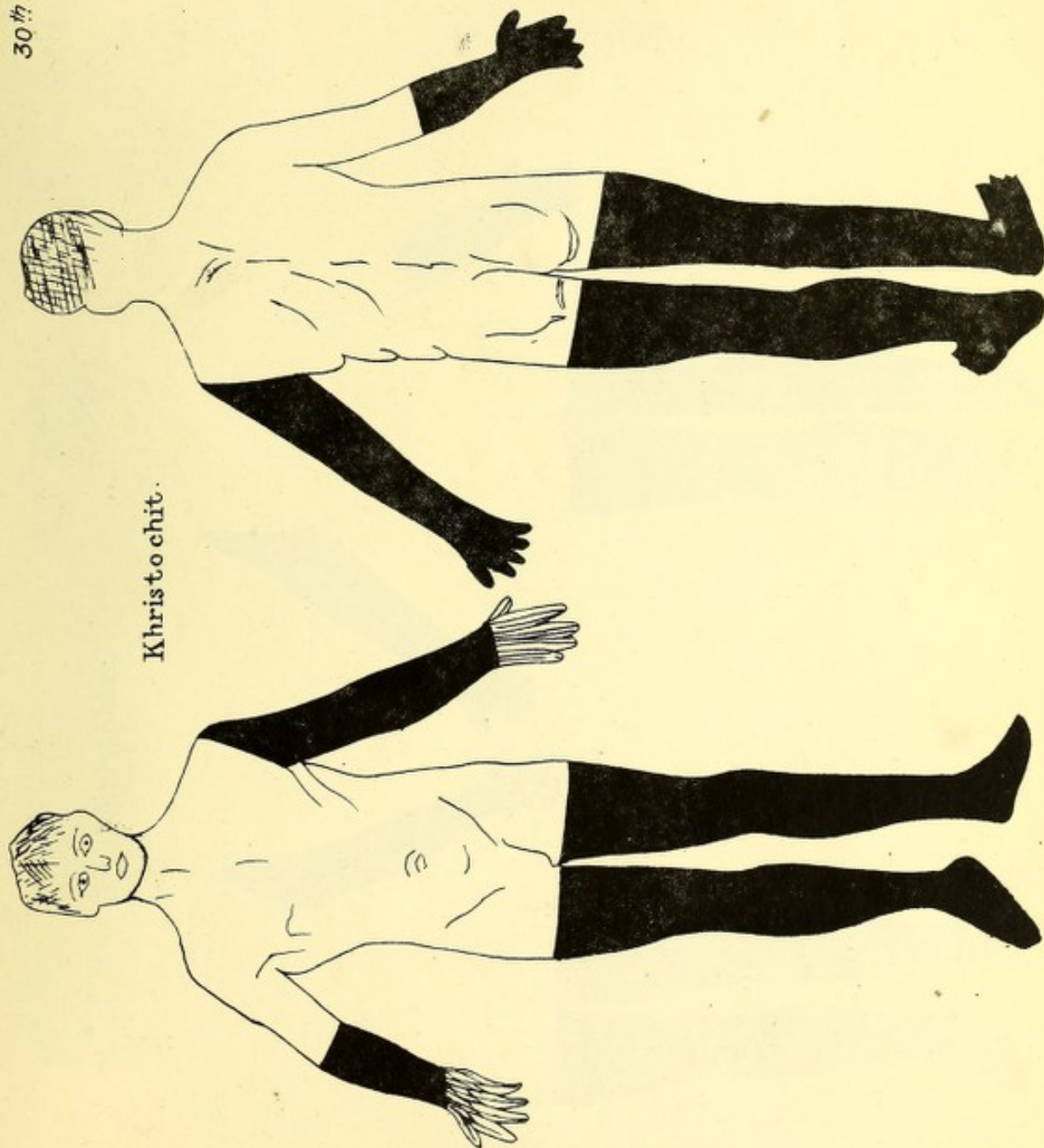


30<sup>th</sup> September 1909.

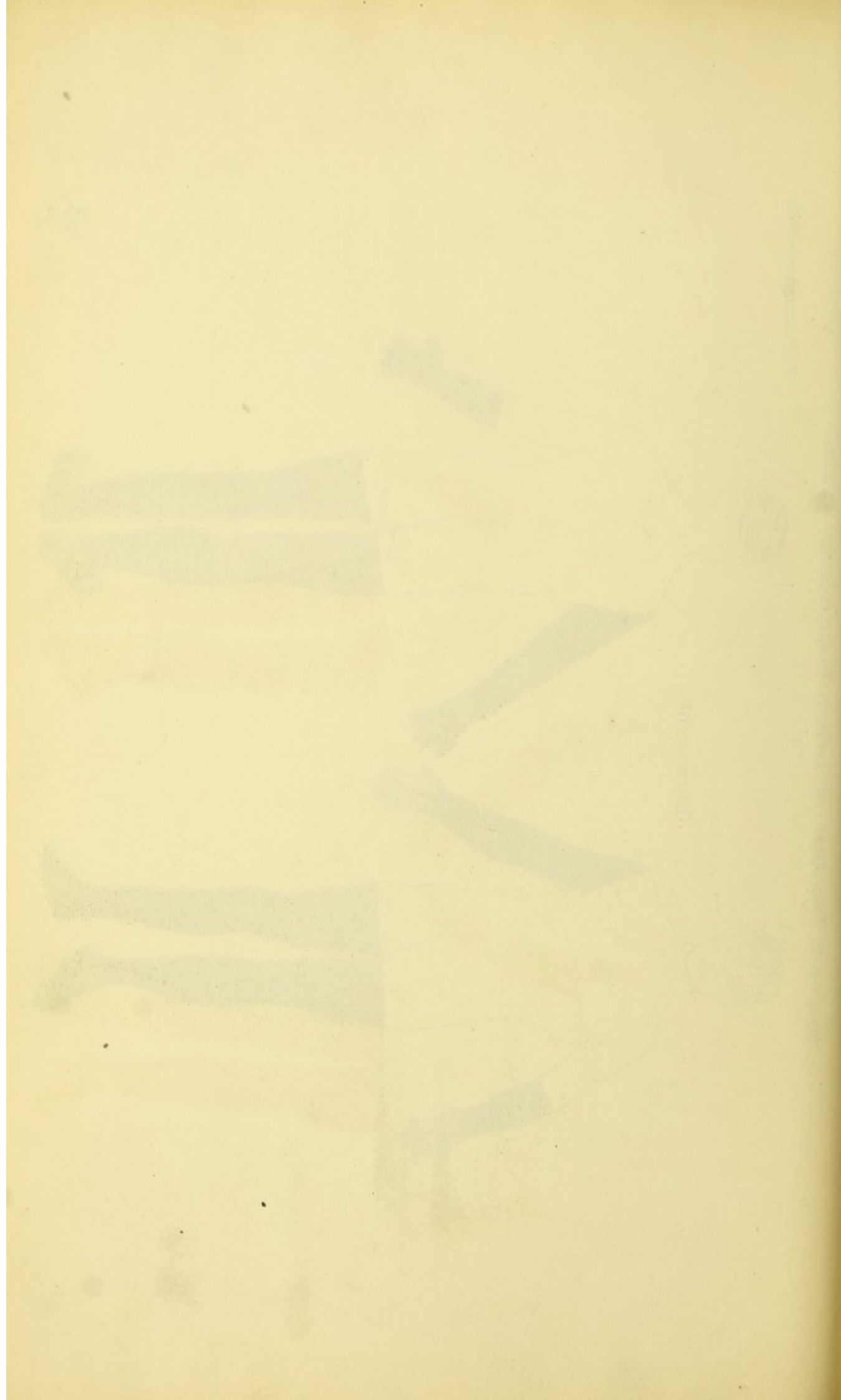
(27)

fig. 2

Khristo chit.





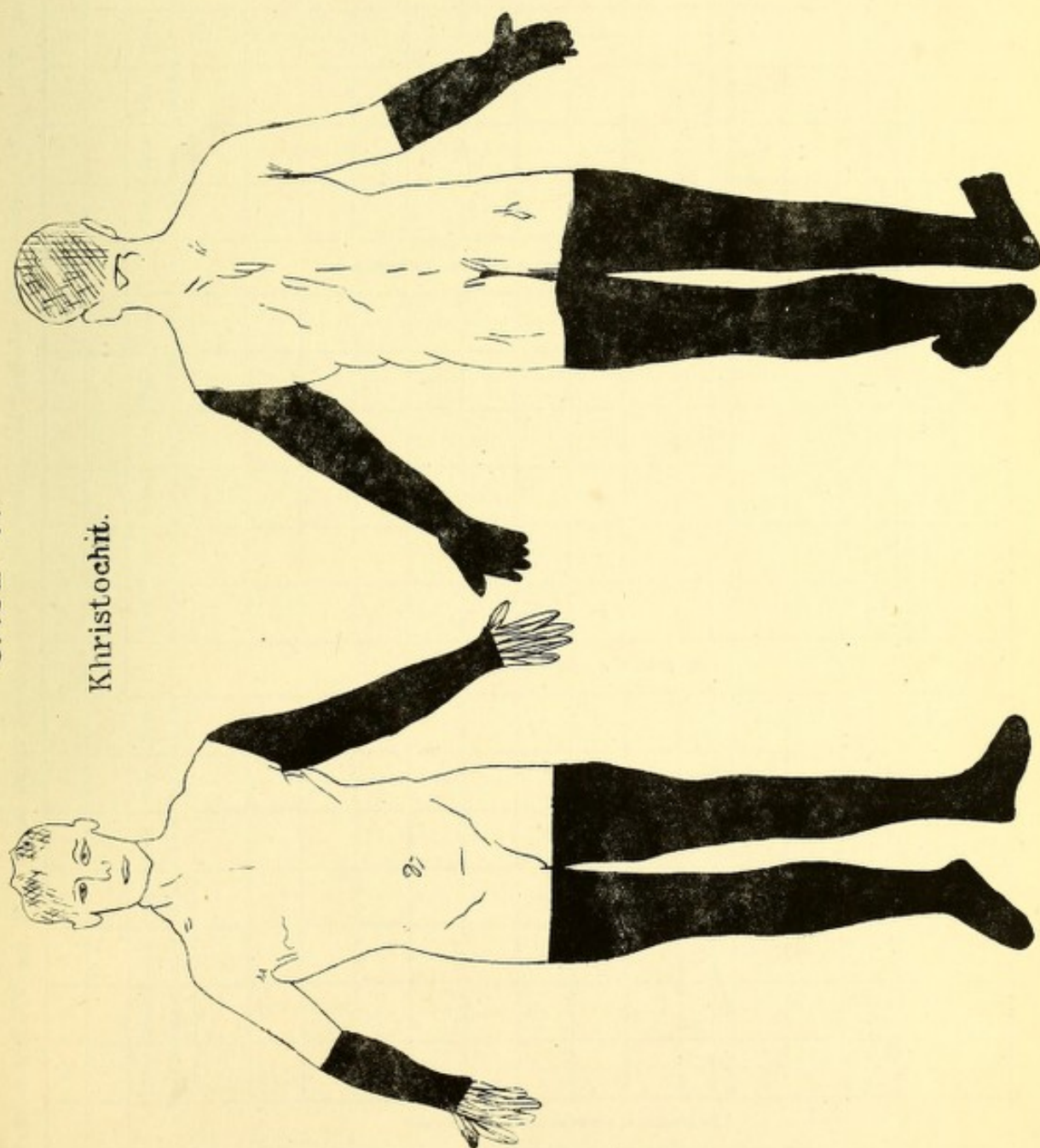


2<sup>nd</sup> November 1909.

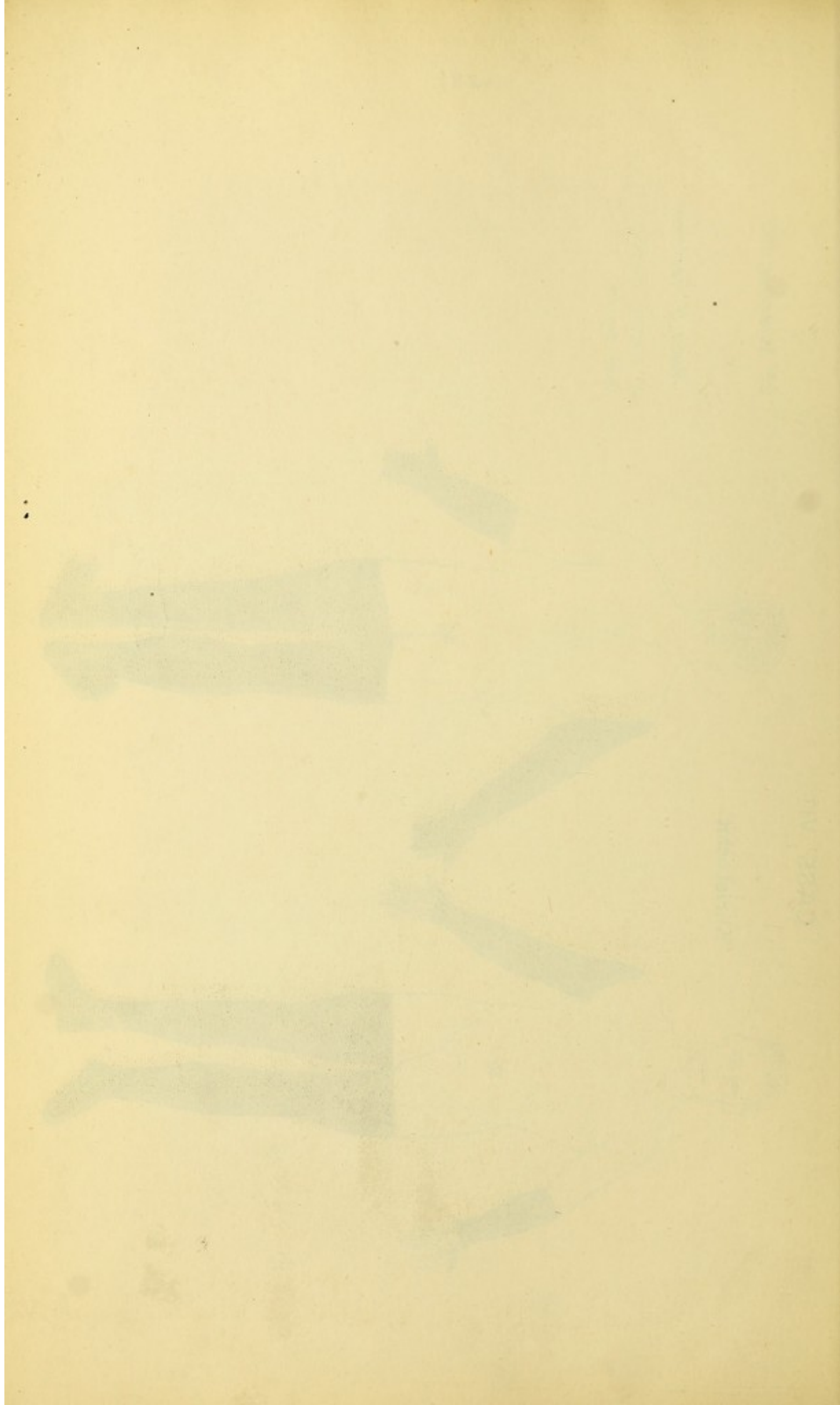
*Nadim B. Treatment  
of Leprosy Furukha  
Leprosy Asylum.*

CASE VI

Khristochit.







*Name, Kartick; caste, Kurmi; age, 35; Disease, Mixed Leprosy; date of 1st injection, 2nd September 1909; date of attack, 1902; more Result*

67

4th injection at 4 P.M. on 10th September.

[illegible]











## NASTIN B TREATMENT OF LEPROSY—PURULIA LEPER ASYLUM

[September.

## RECORD OF TEMPERATURE, PULSE AND RESPIRATION.

Date of attack, 1900.

Name, Liliu; caste, Teli; age, 35; disease, Mixed Leprosy; date of 1st injection, 2nd September 1909. Result 19.

Date of Observation	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Days of Disease.																												
Temperature Fahrenheit																												
108°																												
107°																												
106°																												
105°																												
104°																												
103°																												
102°																												
101°																												
100°																												
99°																												
98°																												
97°																												
96°																												
PULSE PER MINUTE																												
RESPIRATIONS PER MINUTE																												
HOWELS (NUMBER OF STROKES)																												

3rd injection at 4 P.M. on 16th September.

2nd injection at 3 P.M. on 9th September.

1st injection at 3 P.M. on 2nd September 1909.

4th injection at 4 P.M. on 30th September.























Case IV.

NASTIN B TREATMENT OF LEPROSY—PURULIA LEPER ASYLUM.

September and October.

RECORD OF TEMPERATURE, PULSE, AND RESPIRATION.

Name, Daghu; Caste, Kurmi; Age, 25; Disease, anæsthetic leprosy; Date of 1st injection, 16th September 1903; Date of attack, 1903.

Result Date of Result 19 .

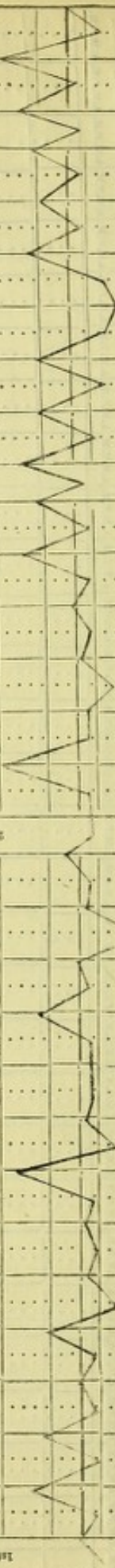
Dates of Observation.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Days of Disease.																															
Temperature Fahrenheit 108°																															
107°																															
105°																															
106°																															
104°																															
103°																															
102°																															
101°																															
100°																															
99°																															
103°																															
97°																															
96°																															
PULSE PER MINUTE																															
RESPIRATIONS PER MINUTE																															
BOWELS (No. of stools).																															

1st injection at 4 P.M. on 16th September.

2nd injection at 4 P.M. on 26th September.

3rd injection at 4 P.M. on 7th October.

4th injection at 4 P.M. on 14th October.





## RECORD OF TEMPERATURE, PULSE AND RESPIRATION.

*Name, Baghu; caste, Kurmi; age, 25; disease, Nerve Leprosy; date of attack, 1903.*

### Result

Date of Result

61

( 39 )

[illegible]

S. ANDERSON, Major, I.M.S.



Page 7.

## NASTIN B TREATMENT OF LEPROSY--PURULIA LEPER ASYLUM.

*September and October.*

## RECORD OF TEMPERATURE, PULSE, AND RESPIRATION.

*Name Sorola; Caste, Bauri; Age, 20; Disease, mixed leprosy; Date of 1st injection, 6th September 1909; Date of attack, 1906.*

Result	Date of Result	19
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[illegible]







*October.*

# NASTIN B TREATMENT OF LEPROSY—PURULIA LEPER ASYLUM.

### Case VI.

RECORD OF TEMPERATURE, PULSE AND RESPIRATION.

Name.	<i>Kristodit</i>	Date of Result	Result	Date of Result	19 .
<i>Name, Kristodit; Castl. Mohala; Age, 22; Disease, mixed leprosy; Date of attack, 1908.</i>					

## Results

Date of Result

19 .

[illegible]











FINAL REPORT ON EXPERIMENTS WITH PROFESSOR DEYCKE'S NASTIN B IN THE  
TREATMENT OF LEPROSY.

It is now eight months since Government deputed me to carry out experiments with Nastin B in the treatment of lepers at the Leper Asylum in Parulia. I may here to begin with state, that having already carried out experiments with other alleged cures for leprosy, I am now in a position to give an expression of opinion as to the results obtained by the use of Professor Deycke's Nastin B.

In a preliminary report on this investigation up till the 3rd November 1909, I have already indicated the "general scope of the enquiry." To the remarks then noted I would add that the Superintendent has practically given me a free hand in dealing with the inmates and in addition has requested me to carry out the treatment on two cases from other Mission stations. This is a very notable fact, considering the hesitation at first shown in obtaining volunteers.

The conditions of the treatment have been carried out, as far as possible, in accordance with Deycke's postulates as given in the preliminary report. Under these conditions had Nastin no immediate effect, but required a prolonged course before abatement of the chief symptoms could be looked for, the real point at issue would be whether the improvement is such as would occur when Nastin is administered in the proper strength and dose and at proper intervals or is merely the ordinary period of quiescence frequently observed in this disease when the patient is placed under good hygienic conditions. As with former alleged cures, doubts will therefore be cast on the efficacy of Nastin, but in my hands time has proved from the minute observations hereafter recorded that we have in Nastin a remedy, which as Deycke contends, in suitable cases causes a partial or complete amelioration of the symptoms. That the issue might not be confused, the giving of drugs in combination with the Nastin treatment, was not resorted to until after some months' trial and only in special cases.

The selected cases, as noted in my previous report, were mainly of the mixed type, of a moderate degree of severity, and the duration of the disease varied from 2 to 10 years. Of the 6 volunteers, 4 showed a predominance of one or other type, viz., cases 3 and 6 were mainly "nodular," the anæsthesia being secondary, cases 4 and 5 were true nerve leprosy, whilst cases 1 and 2 displayed both forms equally.

I propose to give a description of the progress of each case since my last report, which symptoms may be compared with the original description of the disease as presented in each.

To demonstrate thoroughly the effect of Nastin it has been deemed necessary to give a temperature and pulse chart, showing the daily variations in each case since last report.

The statements and inferences made are the results of observations made from week to week, and as the line of treatment best suited appears to be similar to the manner in which syphilis is treated with mercurials, so weekly observations are sufficient since the treatment must be carried out at regular intervals, spread over a long period of time. It should also be observed here that it is a difficult matter to inform a patient what measure of improvement is likely to take place within a certain period of time. In general terms it may be said that sensation may return and tuberosities will be absorbed in the course of some months, whilst in others the effect may be very little; this is apparently the opinion of Professor Deycke, as may be inferred from his published papers.

*The supply of Nastin.*—This was obtained from Messrs. Smith, Stanistreet & Co., of Calcutta, who are the Agents here for Messrs. Kalle & Co. of Biebrich. My supplies included the three strengths of Nastin and also Ketyn, and these were delivered in their original packages and were of uniformly good quality. In one package only was there a leakage from a bottle of Nastin B<sub>1</sub>, which bottle was duly discarded.

*The mode of injection.*—The injections were given weekly by myself every Thursday afternoon. The patients used to parade regularly at that time and



only one of the original volunteers, viz., case 6, Khristochit, backed out of the treatment, and as an exactly similar type of case, viz., case 3, Masidhoni, is still undergoing it, his declension did not materially affect the investigation.

As a rule the patients themselves chose the site of injection, but preference was mainly shown for the sides of the abdomen and the upper arm. After thorough cleansing with 1-500 Lotio Mercuric Iodide in spirit, the parts were allowed to dry thoroughly. The tincture of iodine may also be used as a sterilizing paint over the site of injection. It is necessary that the injection should be given subcutaneously and not intramuscular, and whilst it has been asserted by some that the injections are painless, this did not prove to be the case. In those patients who to begin with had marked anæsthesia, the injection caused little pain, but as gradual improvement took place, it was noted that the giving of the injection caused gradually more pain lasting in some cases half an hour and even longer. In such cases the gradually increasing pain was taken to be a good token, inasmuch that it showed that the sensation of pain was gradually returning in affected areas. In some cases a certain amount of induration occurred at the seat of injection, which gradually passed off in the course of a week or so, but in other cases persisted for a long time. Although I have personally administered upwards of 130 injections, in no case have I had any untoward result, and in no case did suppuration occur at the site of injection.

I use an all-glass B. W. & Co. hypodermic syringe, the separate parts of which and the needles are kept in a glass stoppered bottle containing ether. When required the separate parts are freed from the ether by passing them over or through the flame of a spirit lamp. When many patients are being done at one time it is not necessary to pass the needle through the flame of a spirit lamp each time before injection, so long as the needle is not allowed to come in contact with an extraneous body. After use the separate parts of the syringe are simply returned to the bottle of ether, but some should be drawn up the needle and the needle alone be passed through the flame. The Nastin in the needle burns with the smell of burning fat or oil and may again and again be dipped into ether and reheated until no further Nastin is present. The Nastin in the syringe falls down as an oily drop which later becomes a flocculent sediment. A layer of cotton wool placed at the bottom of the bottle of ether will prevent accidents to the glass syringe.

*The selected cases.*—The following is a general summary of the notes of my cases since the writing of my preliminary report on the 3rd November 1909:—

#### CASE 1. KARTICK.

(1) *Treatment.*—Commenced on 2nd September 1909, and up to the 28th April 1910 he has received the following injections:—

- (a) Seventeen injections of Nastin B<sub>1</sub>.
- (b) Two injections of Nastin B<sub>2</sub>.
- (c) One injection of Ketyn.

(2) *Progress to 28th April 1910.*—This patient for a long time reacted very well to the treatment. Marked improvement in his general health was noted up to the end of January until he received two injections of Nastin B<sub>2</sub>, which he did not seem to tolerate so well as B<sub>1</sub>.

The injection of B<sub>2</sub> was given in the hope that by pushing the treatment somewhat, still better results would be obtained; that this was not so is exemplified by a perusal of the daily temperature chart, which shows that though the first injection of B<sub>2</sub> was well borne, yet the second given one week later produced a pronounced local and general reaction lasting over one month. During the period of reaction he complained that he could not eat nor sleep well, of a peculiar contraction or tension in both forearms and of general weakness. The temperature during this period was usually normal in the mornings but rose regularly every evening to 100°F., and on two occasions to nearly 102°F.

The effect of the injection on the 24th February of 1 c.c. Ketyn should be specially noted in this case, in that it appeared to manifestly hasten the return to normal. During the past week the same intolerance of even Nastin B<sub>1</sub> has developed.



At the same time it must be remarked that his general nutrition has not appreciably suffered, his weight being now  $98\frac{1}{2}$  lbs. as compared with  $92\frac{1}{2}$  at the commencement of the treatment.

The improvement as regards objective symptoms and subjective sensations as noted in my previous report continues; he states that he feels better, the crawling and tingling sensations and shooting pains have entirely gone, he can walk better and can walk further without feeling tired and sleeps better, whilst his appetite continues good and the bowels are regular. His physiognomy has also markedly improved since last report, the eyebrows, ears, and lips have become normal and almost all the lepromata have absorbed, except slightly over the cheeks and nose, but this cannot be recognised from a distance.

The marked improvement in the return of sensation is also evident on comparing the sketch sent herewith as compared with that sent with my previous report.

#### CASE 2. LILU.

(1) *Treatment*—Commenced on the 2nd September 1909 and up to the 30th April he has received the following injections:—

- (a) Fifteen injections of Nastin B<sub>1</sub>.
- (b) Three injections of Nastin B<sub>2</sub>.
- (c) One injection of Ketyn.

This patient started off in November with benign tertian malaria, during which period he received no injections. On the 25th November 1909 the injections of Nastin B<sub>1</sub> were again commenced and were continued with fair regularity until after the third injection of Nastin B<sub>2</sub>, when a certain degree of reaction appeared which was in great part resolved by the administration of Ketyn.

This case is almost similar in many respects to case 1 and apart from being a milder type of the disease shewed almost similar results. His general nutrition is good and his weight is now  $103\frac{1}{2}$  lbs., a gain of  $2\frac{1}{2}$  lbs. in the interval. The shooting pains and crawling sensations have disappeared, he feels lighter, but he still has some tingling in the eyebrows. The appearance of his face is not much changed, the appetite is good, the bowels regular, and his walk has also improved. The lepromata, which were previously raised and dark are still dark, but level with the surrounding skin and can with difficulty be distinguished at a distance.

The anaesthesia has markedly diminished as shewn in the sketch.

He can now use his fingers freely and there is no dull sensation at the tips as before. He also states that he has now complete sensation in the soles of both feet and that he can feel the ground better when walking.

On reference to the previous sketch of anaesthesia, a patch is well marked over the left buttock. On one occasion the patient asked that the Nastin injection be given in that area, not only because there was less pain when it was injected there, but he discovered that by again injecting in the same situation sensation began to return in the affected area.

#### CASE 3. MASIDHONI.

(1) *Treatment*.—Since the commencement on the 2nd September up to date (30th April 1910) she has received sixteen injections of Nastin B<sub>1</sub>.

(2) *Progress to 30th April 1910*.—This case was noted in my last report as the most remarkable of the series in the way of improvement, but whilst she has on the whole held her ground, the improvement is not so great as one would have expected. This is partly accounted for by the fact that she went home on leave in November and as the result of much walking her feet swelled and having caught a chill during the cold weather in December she had fever which could not be put down to the treatment. The injections were therefore given only in the intervals when her temperature was fairly normal, and yet she showed a certain amount of intolerance to the Nastin. The last injection of Nastin B<sub>1</sub> was given on the 3rd March, but ever since her return from leave on the 1st April and since the hot dry weather began there has been marked general reaction, so that under the circumstances an injection of Nastin was contra-



indicated. On the whole, her general condition has been good, the tingling and shooting pains have completely gone and the crawling sensations have disappeared except over the nose and forehead.

Her general appearance has improved, the leprosy nodules over the face, the fingers and toes having become absorbed and so given them a more shrunken appearance.

The appetite is good, the bowels regular, she sleeps well, she walks better and her weight is constant at 80 lbs.

On the 21st January it is noted that a bulla formed over the inner side of the calf of the right leg, which was almost dried up on the 3rd February; at various times also small ulcers formed on the toes and soles of the feet due to tropho-neurotic changes and usually healed up in the course of three-four weeks. At present there is a fissure on the sole of the right foot and a small ulcer is now healing on the left big toe.

The anaesthesia has also diminished as shown in the accompanying sketch. She complains of a burning sensation all over the body during the heat of the day and more marked since the dry hot weather began.

#### CASE 4. BHAGHU.

(1) *Treatment*—Commenced on the 16th September 1909 and up to date he has received the following injections:—

- (a) Fifteen injections of Nastin-B<sub>0</sub>.
- (b) One injection of Nastin-B<sub>1</sub>.
- (c) Two injections of Nastin-B<sub>2</sub>.

(2) *Progress to 30th April 1910.*—This is a case of true "nerve leprosy," which has been treated with Nastin B<sub>0</sub> as consistent as was possible considering the reaction produced by it at intervals and the fact that even Ketyn did not, in contrast with its effect in nodular leprosy, have any appreciable effect in lessening it, yet the concomitant symptoms improved, the small ulcers quickly dried up and his general condition also improved.

As directed by Deycke, the weakest Nastin-B<sub>0</sub> was employed up to the 13th January, and then to further test its efficacy as the patient seemed so much improved an injection of Nastin B<sub>1</sub> was given. This appeared not to disturb him up to the 17th when he went on three days' leave and then had high fever again, probably due to a chill on his return journey.

Throughout the treatment the small ulcers so characteristic of nerve leprosy were continuously recurring; this is said to be a sign that the Nastin is effective.

On the 25th November, on the left foot he had a small ulcer, the size of an eight-anna piece below the great toe, a small ulcer on the outer side of the sole at the base of the little toe and also a small ulcer on the second toe of the right foot. On the 9th December it is noted that the ulcers above described are rapidly healing, but that 3 or 4 days ago a small ulcer started over the inner side of the upper left calf of the leg and also one over the base of the great toe of the right foot. On the 16th December it is noted that these ulcers are also healing.

The crawling, tingling, and shooting pains in the forearms and legs, though much mitigated, are still present, whilst the burning sensation in the feet also persists.

The anaesthesia has also markedly diminished (*vide* sketch) and especially during the last two months; this is well shown in the sketch where in places it is seen that in large areas formerly anaesthetic, a complete or partial return of sensation is noted.

His general nutrition has not suffered, his present weight being 101 lbs. as compared with 99½ lbs. on the 23rd December and 90 lbs. at the commencement of the treatment.

His appetite is good, his bowels regular and he sleeps well but there is not much improvement in walking.

A marked feature in the treatment has been the comparatively healthy growth of the nails on the toes of the feet, where formerly there was nothing but a small stunted growth of nail.



## CASE 5.—SOROLA.

(1) *Treatment*.—Commenced on the 16th September and up to date she has received the following injections:—

- (a) Eighteen injections of Nastin-B<sub>0</sub>.
- (b) One injection of Ketyn.

(2) *Progress up to 30th April 1910*.—This is also a case of "nerve leprosy" exemplifying what has been previously noted regarding the exhibition of even weak Nastin, viz., that these cases shew a peculiar susceptibility to it, so that one must watch and go cautiously so as not to produce reaction. At present though she feels better and her strength has increased, there is some tingling sensation in the feet in the mornings and evenings, a crawling sensation in the back, abdomen and right arm, some slight shooting pain in the left leg, a burning sensation in the face, hands and feet during the heat of the day, and some contraction of the right hand and left index finger.

There is no change as regards the *main-en-griffe* of the right hand, as is well seen in the photograph below.

There is a marked improvement in walking, her appetite is good, the bowels regular, she does not sleep well, but her general nutrition has been well maintained, her weight now being 79 lbs. as compared with 77 lbs. at the commencement of the treatment.

The sketch sent herewith shows the extent of improvement of the anaesthesia since last report. At the beginning of February there was marked delay in sensation up to the knee in both legs, but this of late has so rapidly improved that there is now almost complete return of all sensation on the posterior surfaces of both legs. The same is true of the elbow region on the front of the right arm and part of the posterior surface.

She received the 18th injection of Nastin on the 17th March and since then no further injections have been given owing to the erratic nature of the temperature and pulse, as will be noted from the accompanying chart.



PHOTOGRAPHS OF TWO CASES AFTER TREATMENT WITH NASTIN.

(1) Sorola, case 5, true "nerve leprosy" showing the *main-en-griffe* of the right hand and flexion of the left index finger.

(2) Masidhoni, case 3, a case of "nodular" leprosy. The shrinking of the face and the flattening of its surface at the site of former nodules can be made out.



**Results of the experiment.**—The investigations which I carried out were chiefly to determine whether or not the cases treated in accordance with the postulates of Deycke actually showed the results said to have been obtained by him and at the same time to determine the deviations from these which seemed to influence the course of treatment of the disease.

Professor Deycke in his letter to Captain Williams at the Bombay Medical Congress, 1909, contends:—

"In the majority of cases irrespective, of course, of the most severe and hopelessly advanced forms, it will be possible to arrest the process; in many cases there will be obtained a distinct improvement which is evidenced in a particularly pronounced manner by increase in strength and general health, and unmistakable retrogression of the leprosy symptoms. Whereas on the one hand there are lepromas and these, in most cases, are clearly circumscribed tubercular formations which persistently resist the treatment—there are seen, on the other hand, leprosy forms of exanthema, which are acted upon and done away with by Nastin not less promptly than are syphilitic efflorescences by mercury; and frequently extensive, even massy infiltrations are caused to disappear with surprising rapidity. There are gradations between these extremes."

In an extract translated from the journal *Lepra* he writes:—

"In several cases of this nature (pure *lepra nervorum*) we observed extensive and total anaesthesia to completely disappear with surprising rapidity."

"Rapid, visible results should not lead to overrating the new method of treatment and its natural limitations, nor should occasional absence of expected changes and retrogression of leprosy symptoms lead to underrating the method. With patience and fairly clever individualizing, one will be able, excepting, of course, the most severe cases, to always effect immunisation of the organism and, therewith, the arrest of the leprosy process; frequently, however, far better results will be obtained."

After the distinct and comprehensive statement made by Professor Deycke, I think it is only right that the treatment should be criticised on its merits.

I propose to do this in continuation of the headings given in my previous report.

(1) *General health.*—It may be said at once that all my cases have markedly improved in health, as evidenced by increased weight in every case, probably induced by the improved appetite and the general feeling of lightness and well-being, which invariably occurred after 3 or 4 injections. In this result my observations confirm those of Professor Deycke.

(2) *Lepromata and ulcers.*—I noted in my preliminary report that all the cases, with the exception of case 6, showed a steady improvement from the beginning. I then expressed the hope that in this case also ultimate improvement would result and this has actually occurred, though on account of the fresh ulcers he refused further treatment and could not be persuaded to continue it. In any case he shows during the intervening period no palpable increase of the disease, and the trophic ulcers healed in the course of 3 or 4 weeks.

In my previous report, I pointed out that Deycke insists that it is the "action" and not the "reaction" which is effective in therapeutic respects and produces in his opinion "better results in the long run than any reactive solution."

Temporary absorption of all or part of the nodules is often observed during the course of an intercurrent acute illness, such as an exanthematous fever, or during an exhausting disease such as phthisis. In Purulia, according to my experience, the prodromal fever is often lacking, and I also observed fever but seldom during the course of the disease, and then, as a rule, it was but slight.

Scheube remarks that in cases of nodular leprosy "the attacks of fever contribute greatly to still further weakening the patients already sufficiently enfeebled by their disease."

On the contrary, where attacks of fever occurred during the treatment with Nastin, they did not enfeeble the patient as evidenced by a gain in weight in all the cases, and at the same time comparative improvement of the other symptoms of the disease.

All my patients were volunteers, and the effects of the Nastin were so marked, especially in the lepromatous and mixed type of case, that they not only came to believe in the remedy, but when not given they would ask the reason why.



One of the most important features of the treatment is that each case must be treated on its merits; it is hopeless to continue a uniform course, but one must proceed carefully watching its effect in each case. "Idiosyncrasy" plays an important part not only in the selection of cases, but also as regards the particular strength of Nastin employed, and in the regulation of the injections as regards the interval between each; the idiosyncrasy was judged by the effects produced by the injections.

It was those patients who were most tolerant of Nastin and in whom no reaction occurred who undoubtedly showed the most improvement. It is in order to demonstrate this that I attach herewith the temperature chart of one Badoi, a man who came from Tippera, Eastern Bengal and Assam, to be privately treated. His case is a remarkable one in that now he is quite a changed individual; this was a case of the mixed type, large and persistent lepromata were present all over the face and ears and the hands and feet were thickened owing to the neoplasms in the fingers and toes. In addition, he had large maculated anæsthetic areas all over the body; these have now under treatment almost all disappeared. But the chief feature of his case is his remarkably good tolerance of the Nastin, and a perusal of his chart shows that his temperature throughout has been subnormal and apparently Nastin-B<sub>1</sub> ultimately lost its good effect, and even when Nastin-B<sub>2</sub> was pushed the temperatures have remained normal, although he received an injection regularly each week of Nastin-B<sub>2</sub>.

Cases 1, 2 and 3 of my series, though also of the mixed type did not show anything like the same tolerance to Nastin-B<sub>1</sub>, the strength prescribed in such cases. In case 1, 15 injections of B<sub>1</sub> were well borne, in that the temperature remained normal throughout and the other symptoms *pari passu* improved. Two injections of B<sub>2</sub> however produced a "reaction", partly reduced by an injection of Ketyn, and two injections during the month of March again show him to be very susceptible to it as evidenced by an almost daily rise of temperature to 99° and 100° F. A similar degree of intolerance is also seen in cases 2 and 3.

Local reaction in the nodules was usually marked by a feeling of itchiness; in such cases the nodules became red and swollen but never suppured, so that a quiet absorption was going on all the time, from which it might be inferred that Nastin has a specific action on the leprosy nodules. I have already pointed out how such an absorption may take place with other remedies and even without any treatment at all. On various occasions I have examined smears from these nodules and also from ulcers on various parts of the body; these smears have been examined by staining by the Ziehl-Neelsen and Gram's methods and the loss of acid proofness can be easily demonstrated. The degeneration of the bacilli *in situ* can also be demonstrated, but this may occur with other remedies or so-called alleged cures and therefore the changes described by Professor Deycke are not in my opinion unusual.

In ordinary cases where bacilli can easily be obtained from the surface of the body, one usually finds that whilst the greater number take on the ordinary stains used to differentiate them, there will also be present degenerate specimens which appear vacuolated or dotted or in some mere granules. In some of the recent deposits only fully stained bacilli will be found but in older foci only degenerate forms may be found and such bacilli may take on a differential stain.

Pronounced local and general reactions have thus been observed and whilst in these circumstances Deycke rightly insists that "it is imperative to discontinue the injections until these phenomena have completely disappeared", yet I have not observed those "very turbulent reactions which are directly dangerous to life." From a study of my cases I am inclined to think, that whilst in all cases only the action of Nastin is desirable, and that after some weeks of tolerance, yet some "reaction" in a comparatively robust leper with few foci will not only show a marked change in the local lepromata as evidenced by softening and absorption, but also marked general improvement. This can be explained by the view that whilst the ordinary injections gradually cause absorption around the periphery of the local tumours the intensity of "reaction", not only aborts what remains of the local tumours but abolishes the disease *in situ*.



In those cases showing the greatest improvement, viz., in the nodular and mixed variety, the commencement of improvement in a particular area was signalled by tingling or creeping sensations in the part and ultimately in the mixed type where only a few anæsthetic areas remained, an injection made into these areas was beneficial, since sensation almost completely returned and the anæsthesia disappeared.

Cases 4 and 5 show only some improvement as regards the anæsthesia, but any lesions which occurred previous to the injection of the Nاستin were not in the least modified and in the case of Sorola the *main-en-griffe* remained as before, probably due to fibrous contraction in the affected parts. In both cases, however, a marked improvement in the general health took place and their weight, general appearance and walk have improved.

I am satisfied that the treatment with intervals is the correct method, and that after the usual dose at intervals of a week should the least reaction show itself, it is wise to stop until the temperatures are again normal and then to give only  $\frac{1}{2}$  c. c. of Nاستin-B<sub>1</sub> in the lepromata and mixed cases, and  $\frac{1}{2}$  c. c. of Nاستin-B<sub>2</sub> in lepra anæsthetica. I am in accord with Deycke that large doses may frustrate the process of immunization and prove injurious, and believe that the treatment with long intervals, continued for years, on the lines of anti-syphilitic cures, is the correct one.

(3) *Anæsthesia*.—As in my preliminary report, I have had prepared and duly verified a chart of each patient shewing the anæsthetic areas at present, which may be compared with the former charts showing the areas affected before treatment.

As previously indicated, all the cases have shown an improvement in this respect and perhaps the most striking proof of this is that they say they can feel the ground better in walking and they do not now unconsciously burn themselves when cooking their food. In testing them also with the hot and cold tubes they seemed to shew a greater resentment when the hot tube was placed over a recovered area than over originally sound skin.

(4) *Temperature charts*.—These are again very interesting and shew in a graphic manner the general action of the Nاستin, but I have already sufficiently indicated this in the body of the report.

One feature of the temperature charts requires particular note, viz., that so long as the temperature of the air did not register higher than 100°F., the injection of Nاستin was well borne.

But as soon as the dry hot weather began and registered a maximum of over 100°F., then the sudden determination of blood to the surface of the body caused a feeling of burning all over, and the temperature of those patients under treatment went up one and two degrees almost every evening.

This peculiar dependence on climatic conditions is well exemplified in all the charts and on or about the 20th March, when high atmospheric temperatures began to be registered, shows a corresponding rise in the temperature of each patient. To demonstrate this, I attach the charts of maximum and minimum temperatures for the months of March and April.

From this aspect it follows naturally that the best time to commence and to re-inject patients for choice is in India the commencement of the cold weather.

(5) *General remarks*.—Danielssen, who had great experience of leprosy during his practice of more than fifty years, said that "apparent improvement set in after all methods of treatment, and even without any treatment at all, he found that no permanent usefulness resulted from any of them".

Experience gathered from the use of different remedies have thus taught us that transient improvement (especially the disappearance of nodules) can be achieved with many remedies, and I doubt, whether we have in Nاستin a real cure.

The tuberculin fashion led to the treatment with "tuberculin". It was proved that in lepers, as in consumptives, a general as well as a local reaction to it set in. There is this, however, to be said for Nاستin that the best results are obtained where there is no reaction.

In my last report I said that the results are encouraging and time alone can show further developments; I am satisfied that the Nاستin-B treatment



does constitute a real advance, and whilst it undoubtedly aborts the leprosy processes going on in the body just in the same manner as mercurials does in the secondary and early tertiary periods of syphilis, and just as in the treatment of syphilis one cannot say that the cure is permanent, so in my opinion the same applies to Nastin in leprosy.

It is conceivable and even likely that after the primary course, a course of, say, four injections every six months extended over a long period, will not only prevent the spread of any foci remaining over but will abort the disease absolutely.

In my former report I concluded that "apart from the relief of suffering and probable extension of life, the fact of being able to allow lepers after thorough treatment to mix with the general population, without fear of their being a source of the disease is a great *desideratum*." My patients are so confident of cure that they have asked to be separately housed from the other lepers; they stated that they do not wish to mix with others who have open sores, from which they may be re-infected or who may contaminate their food.

I do not agree with Deycke that this treatment is mainly one for institutions; I do not see any reason why the treatment could not be adopted in the out-patient department of a hospital, once its merits are known.

I consider the Nastin treatment to be a good measure for prophylaxis, and that by getting cases in the early stages, where the diagnosis has been confirmed by microscopical examination, we may so immunise them that they will no longer be a danger to the community. By thus immunising suitable cases and allowing for the extinction of those who are hopeless, it may happen, that with organised measures, we may not only be able to prevent the spread of this terrible disease, but in time we may hope, that, as has taken place in some European countries, the disease itself may be stamped out.

*Opinions of other observers.*—Before concluding this report I think it will be advisable to refer to the results observed by others.

Dr. Ashburton Thompson, the permanent head of the Department of Public Health, New South Wales, in a paper published on 5th March 1910, in *The British Medical Journal* gives a good summary of the general results.

He writes:—

"Thus Nastin showed itself in my hands an entirely inert body, save for some irritant effects limited to the seat of injection. My experience seems to have been identical with that of Dr. Lenz\* of Equatorial Africa. Both his and mine differ *in toto* from Professor Ziemann's† account of his trial in the Cameroons, which was so favourable that he asked for a special appropriation of £400 for the purchase of supplies for the ensuing year. Both differ also from favourable accounts furnished by several independent observers‡ in India. On the other hand, they would appear to resemble the result of trial in Manila§, also in a single tuberculous case in London, and of a more general trial in Hamburg, as I have learnt from private communications. On the whole, the only suggestion that Dr. Lenz was able to make by way of explanation of the discrepancy, namely, that his supply for some reason had been at fault, seems unlikely to prove valid."

Finally we have the experience of the Drs. Neve of Kashmir, and with whom I am inclined to agree, viz., that it is too soon to form conclusions regarding the final results, but two things are certain about this remedy and these are that it is very expensive and very prolonged. They add that it is undoubtedly palliative, and there is at least a hope that if it is persevered with, it may prove to be curative.

It remains for me to thank John Sisingi, the Civil Hospital Assistant of the Purulia Leper Asylum, who has given me great assistance in the preparation of this report.

PURULIA,

The 4th May 1910.

SAMUEL ANDERSON, M.B., C.M., B.Sc.,  
D.T. M. & H. (CMB.), MAJOR, I.M.S.,  
Civil Surgeon, Manbhum  
and Medical Officer of Purulia Leper Asylum.

\* 1909, Lenz: *Leprosy*, IX, p. 19.

† Ziemann: *Ibid.*, p. 23.

‡ 1909, Rodrigues, Major F. A. Smith and Captain Bisset, Captain T. S. B. Williams: *Trans. of Bombay Medical Congress*, F. Reschad: *The British Medical Journal*, II, p. 1343.

§ 1909, Heiser: *The American Journal of Medical Science*, Vol. CXXXVIII, September.



*Statement showing the receipt and expenditure in connection with the Nasta treatment of leprosy at the Purulia Lepar Asylum by the Civil Surgeon of Manbhum.*

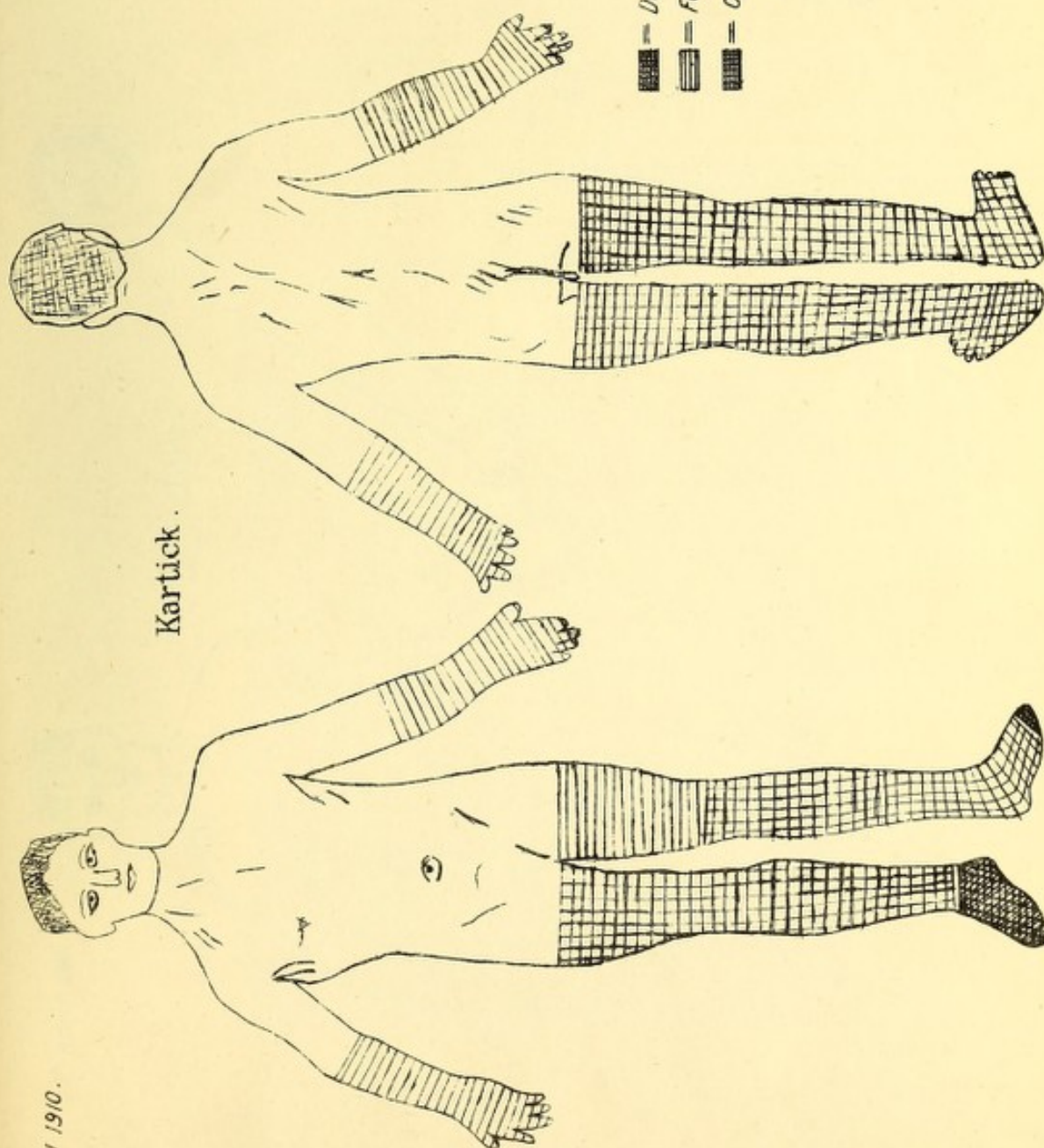
RECEIPTS.		PAYMENTS.	
Nature of receipt.	Amount.	Nature of payment.	Amount.
	Rs.		Rs. A.
Government grant for conducting Nasta treatment of leprosy at the Purulia Lepar Asylum, sanctioned in Bengal Government, Municipal Department, No. 1340 Medl., dated 14th March 1909.	250	Paid Railway freight for a parcel from Messrs. Smith Stanistreet & Co., Calcutta.	1 0
		Paid Smith Stanistreet & Co.'s Bill No. 2292, dated 11th September 1909.	63 5
		Paid Smith Stanistreet & Co.'s Bill, dated 10th November 1909.	75 14
		Paid Smith Stanistreet & Co.'s bill No. 2985, dated 19th November 1909.	11 0
		Paid Smith Stanistreet & Co.'s bill No. 454, dated 14th March 1910.	45 8
Total ...	250	Total ...	196 11

PURULIA;  
The 1st May 1910.

SAMUEL ANDERSON, M.B., MAJOR, I.M.S.,  
Civil Surgeon, Manbhum.



## Case No I

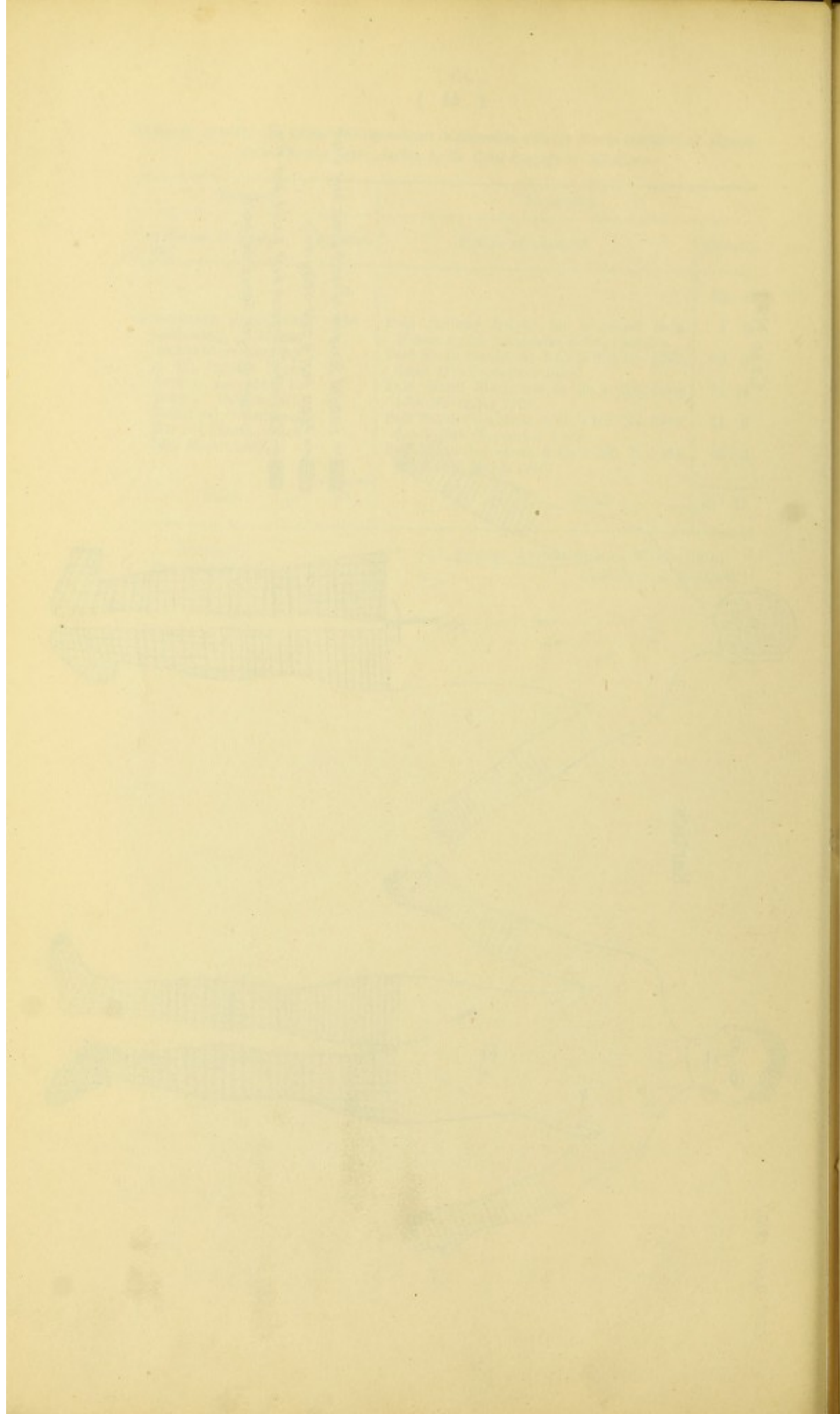


- [Cross-hatch pattern] = Delayed Sensation to touch & pain, heat & cold.  
 [Horizontal lines pattern] = Feels heat & cold delay only.  
 [Vertical lines pattern] = Can not distinguish heat & cold and also over delayed Sensitive part.

29/

29<sup>th</sup> April 1910.



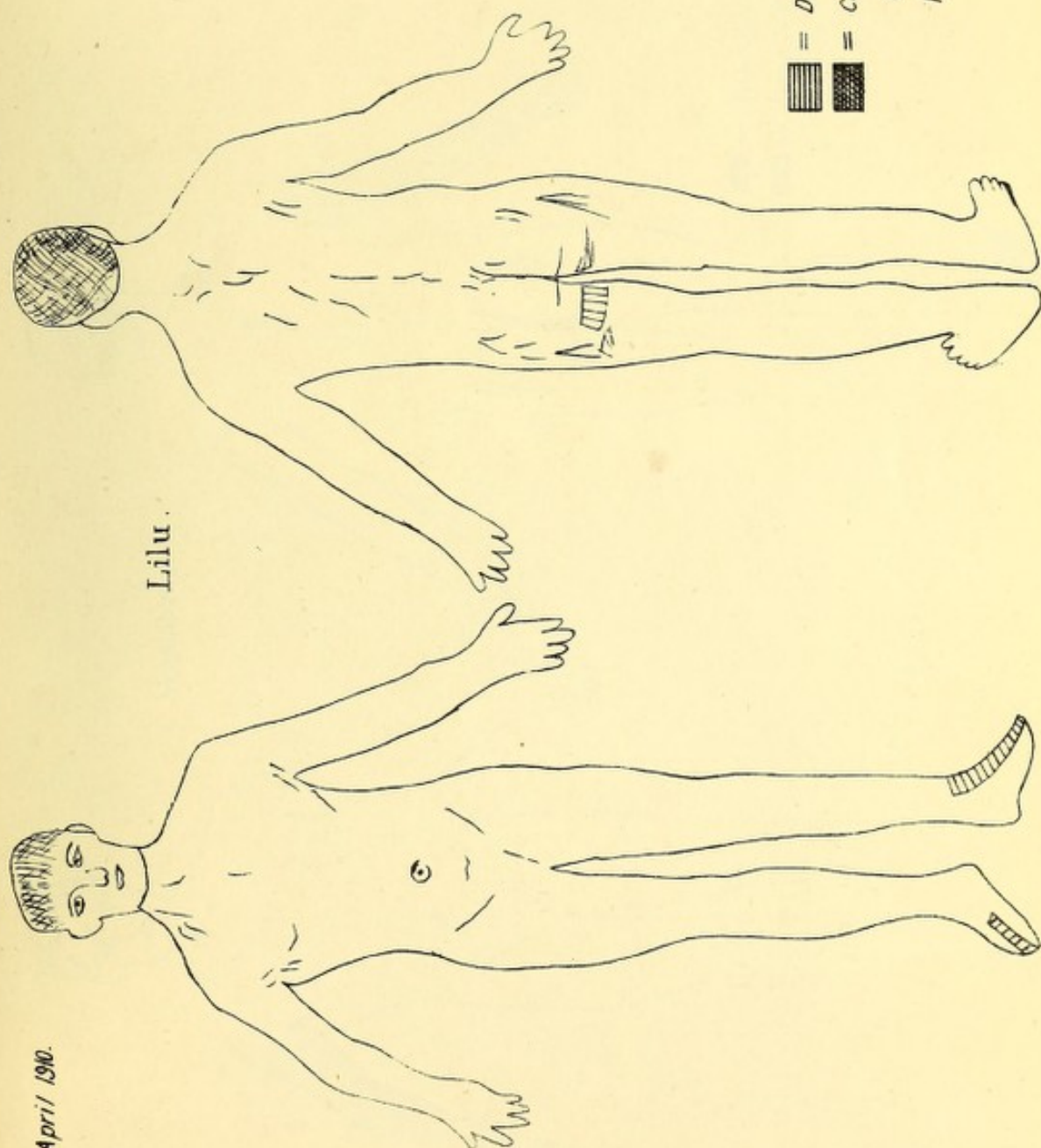




29<sup>th</sup> April 1910.

Case No II

Lilu.

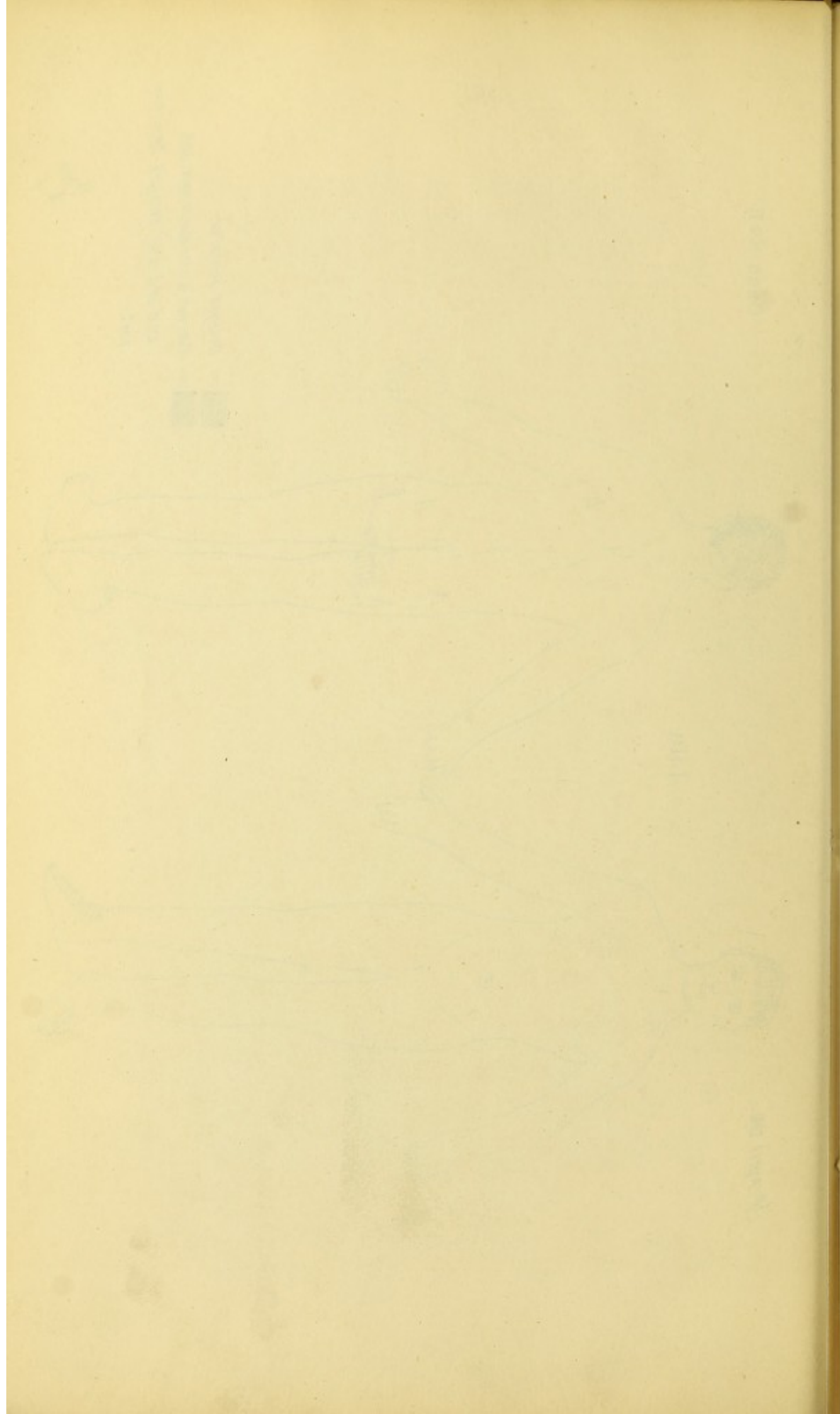


== Delayed Sensation.

== Can not distinguish heat and cold and over delayed sensitive part.

807

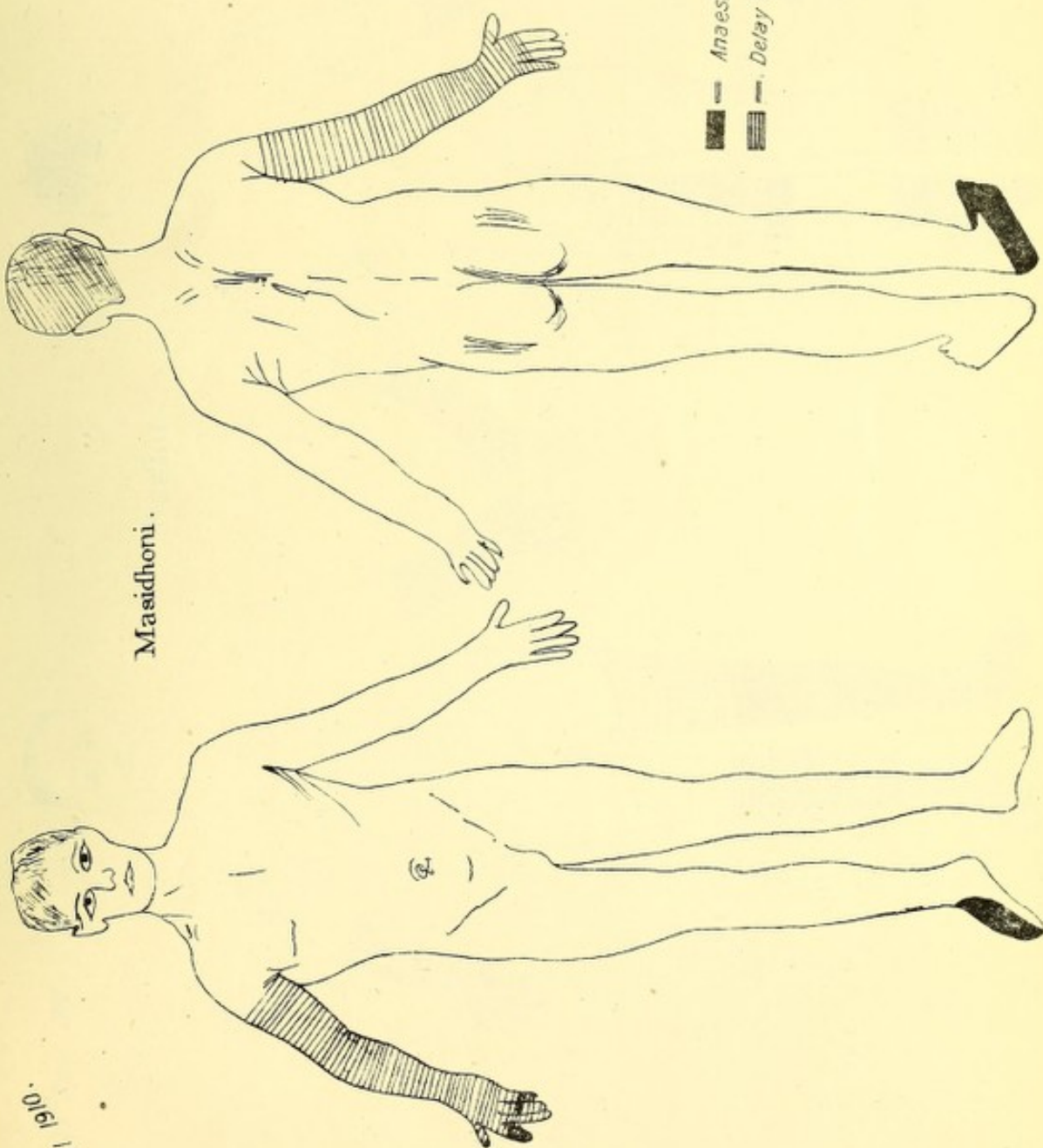






Case № III

Masidhori.



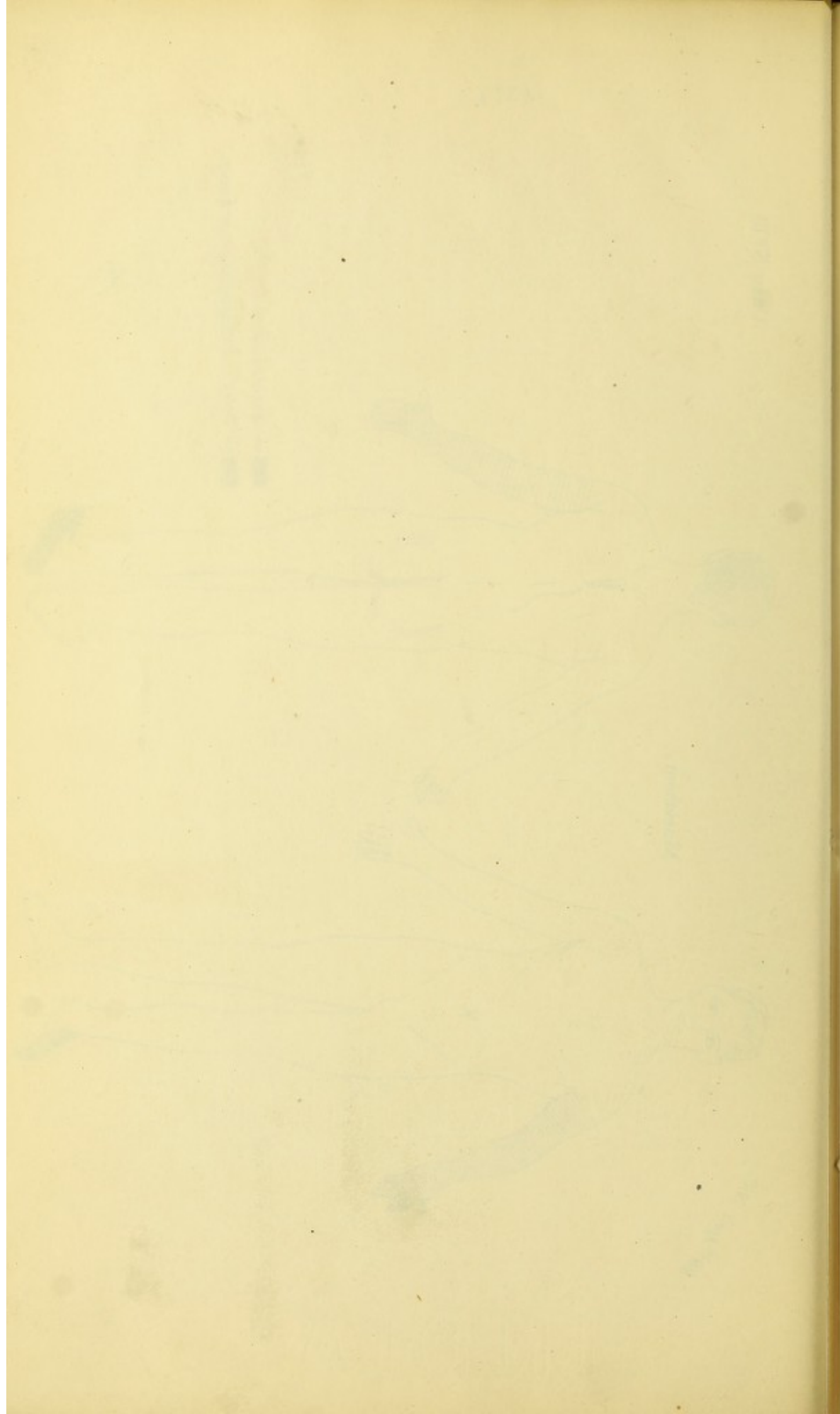
— Anaesthesia.

— Delay in distinguishing heat & cold.

for

29th April 1910.



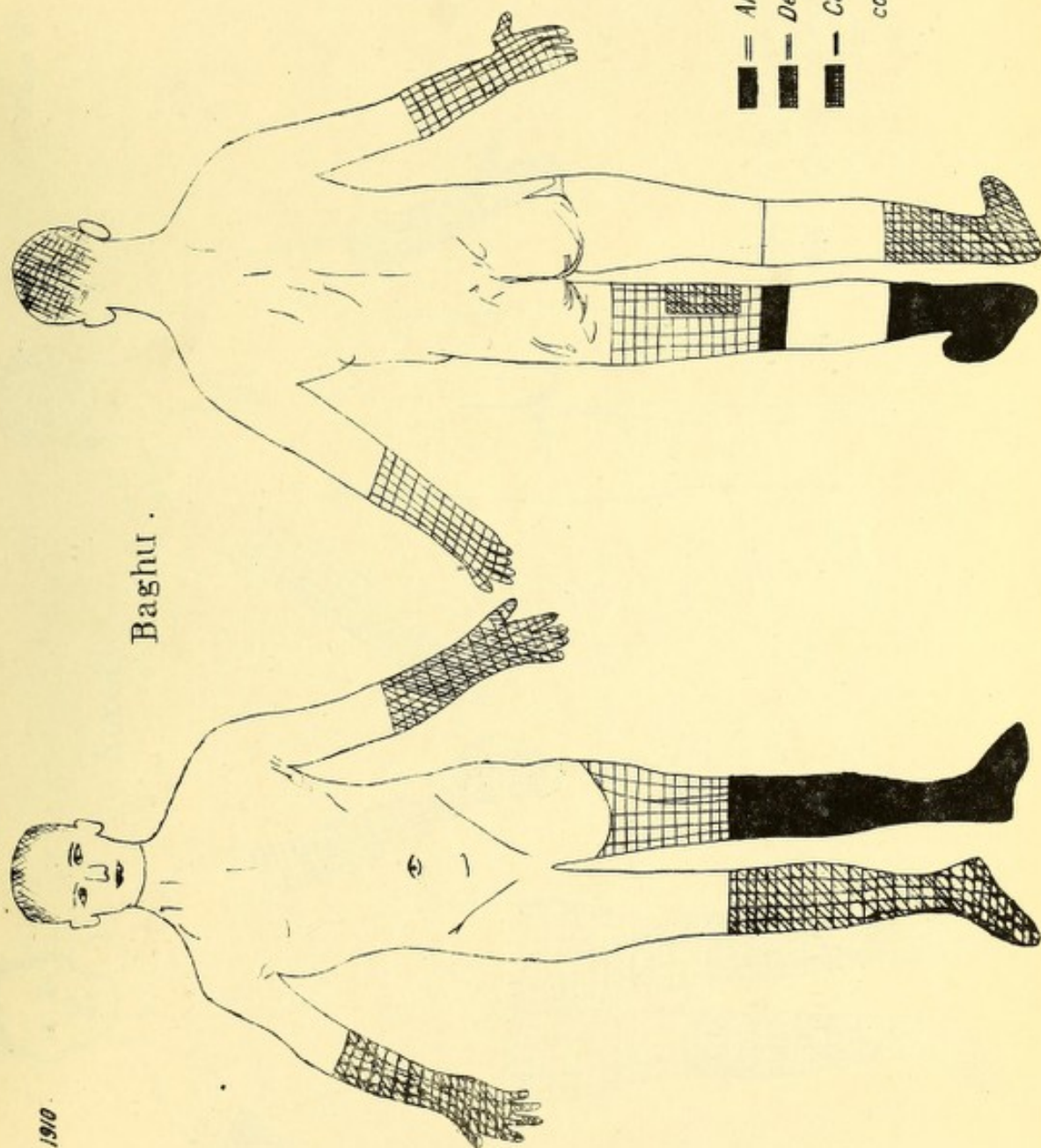




29<sup>th</sup> April 1910.

Case No. IV

Baghur.



— = Anaesthesia.

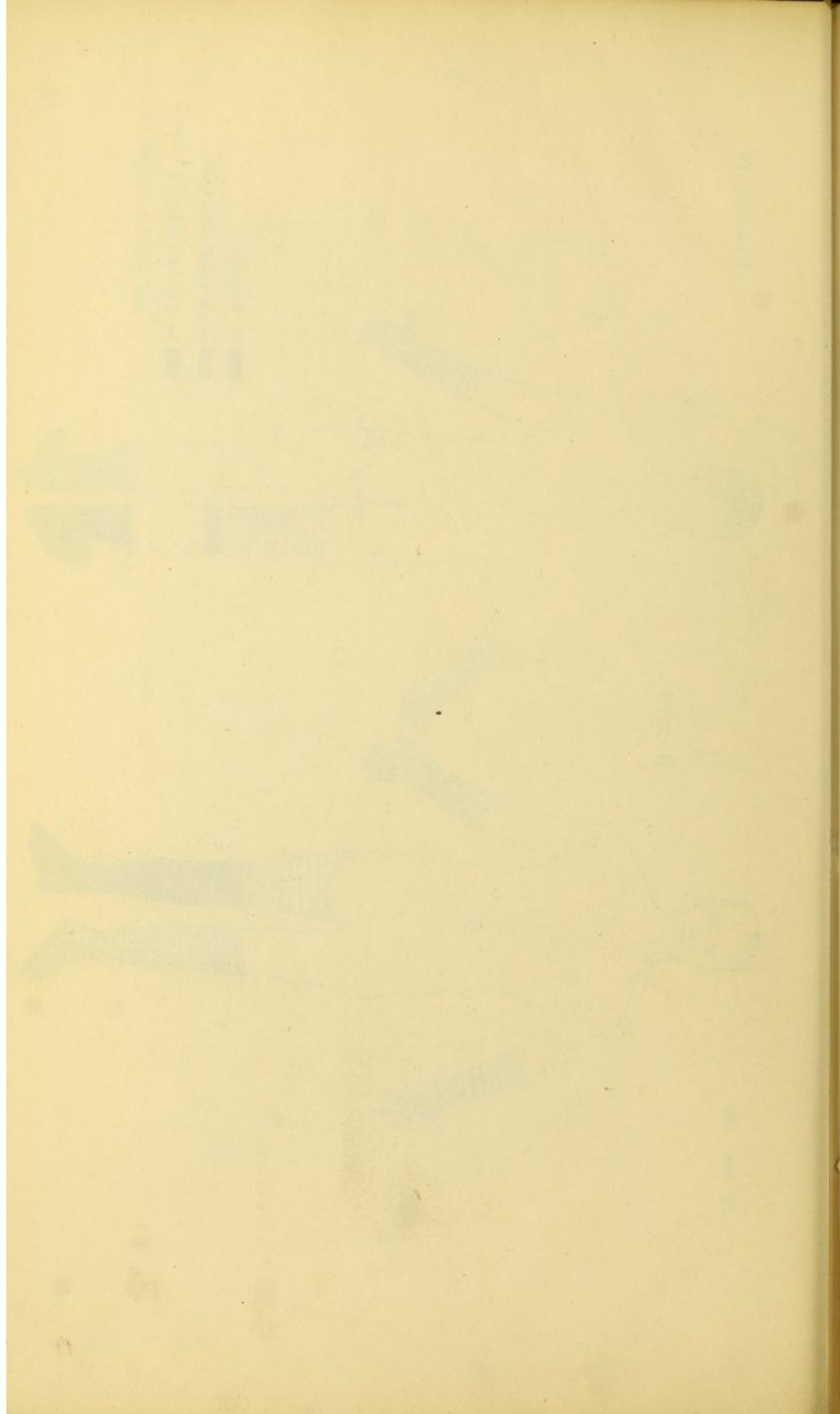
— = Delayed Sensation.

— = Can not distinguish heat &

cold and over delayed sensitive part.

847



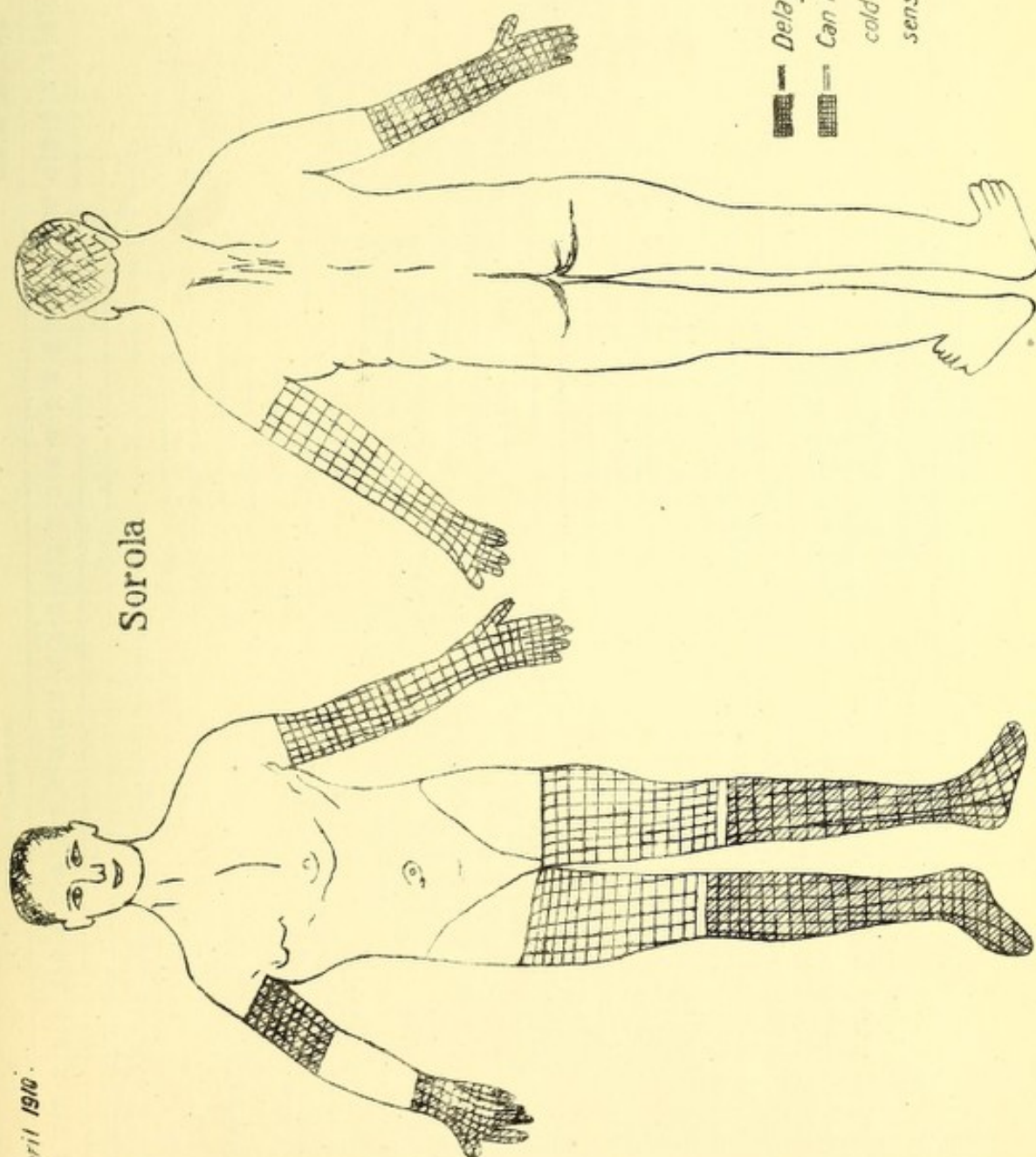




Case No. V

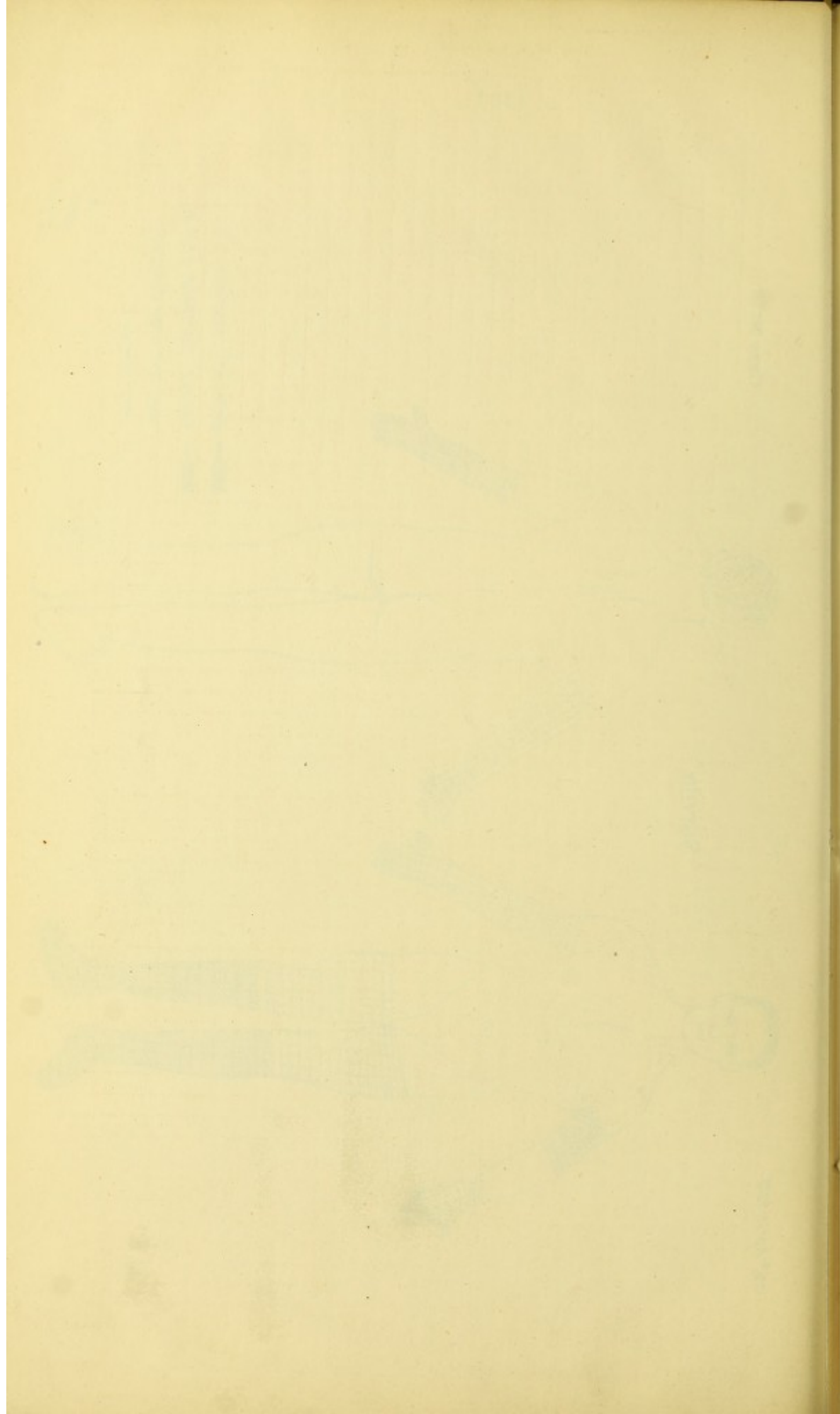
Sorola

29\* April 1910.

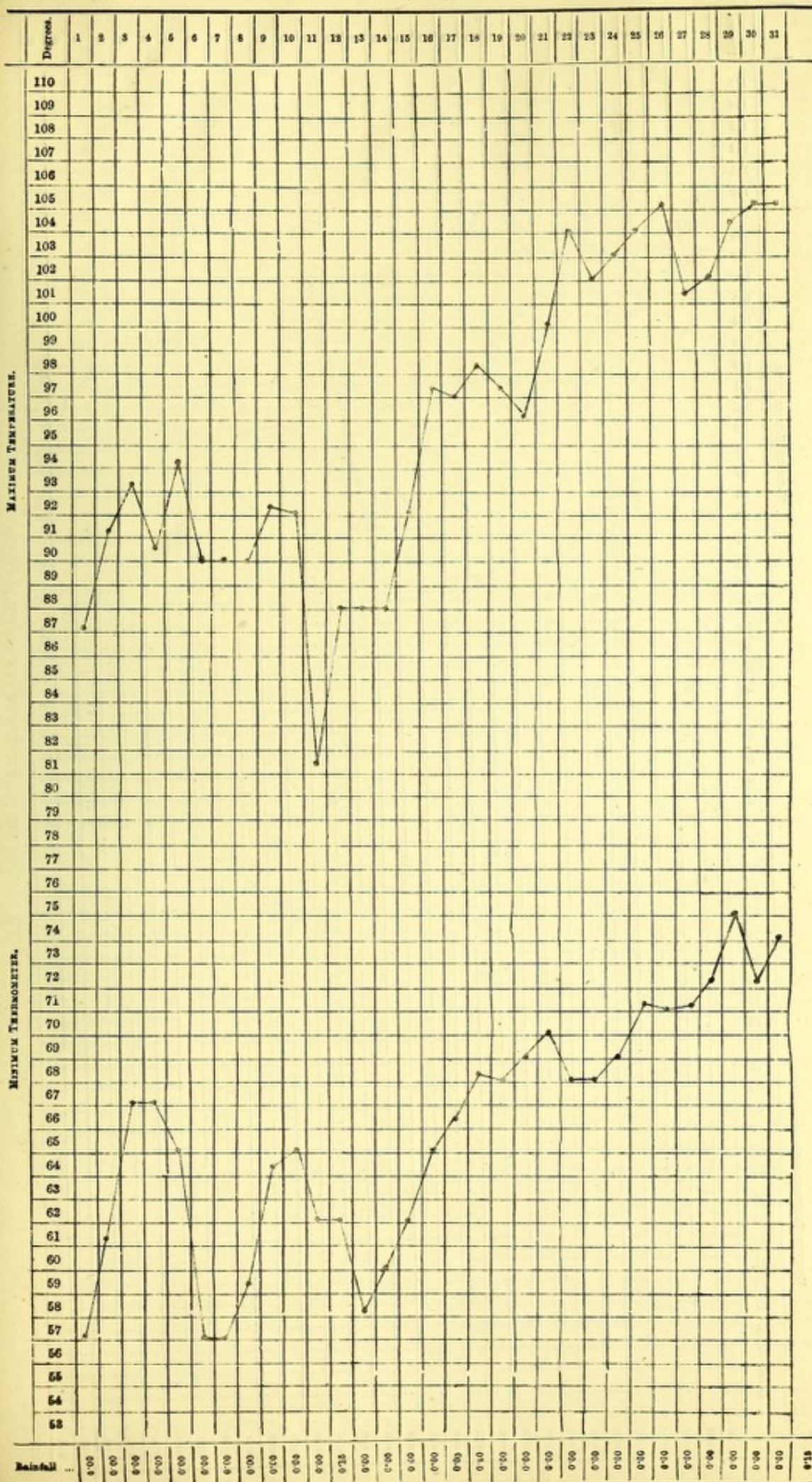


8/3



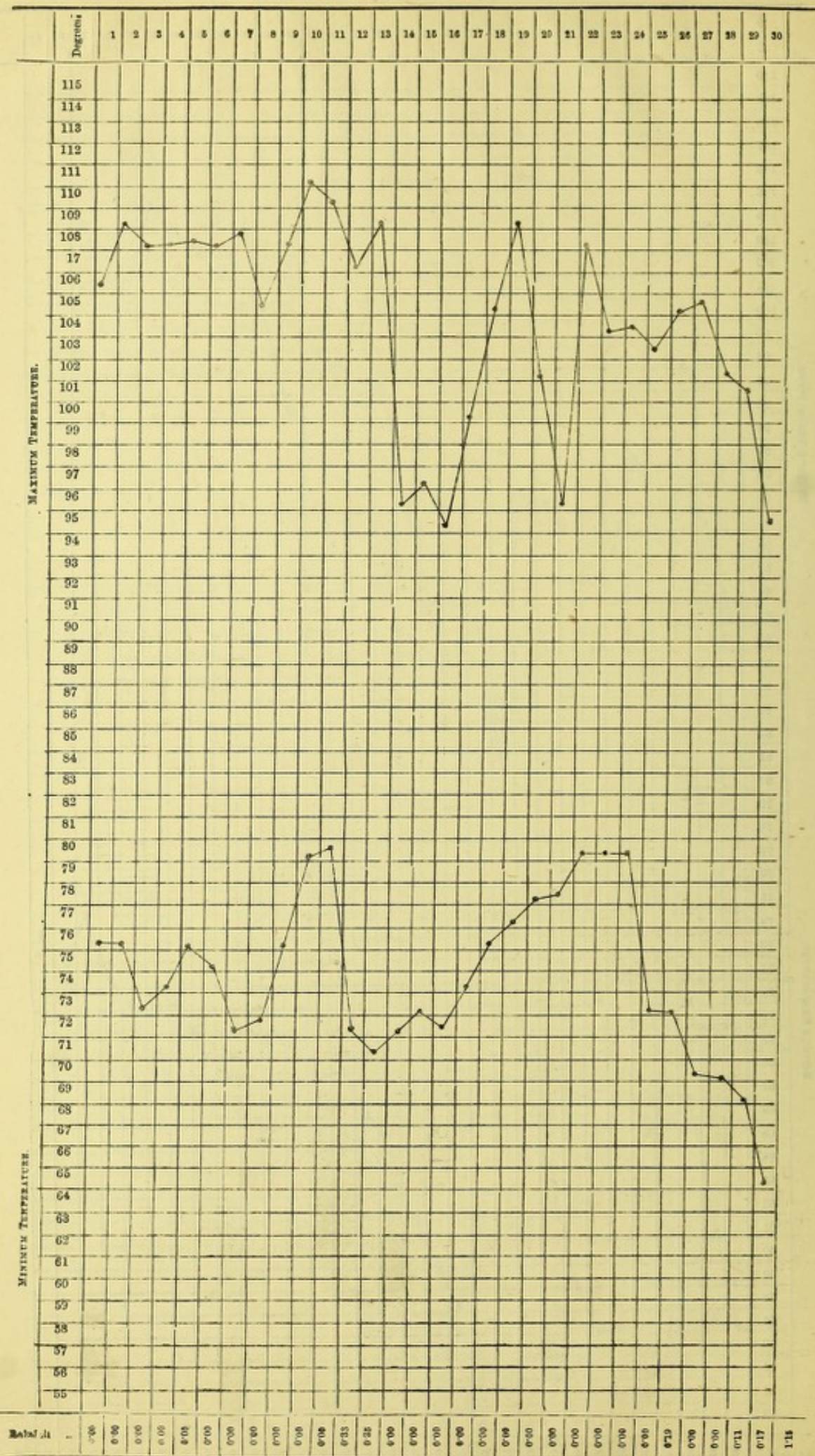








## Temperature Chart for April 1910.





## Case I.

## NASTIN B TREATMENT OF LEPROSY—PURULIA LEPER ASYLUM.

November.

RECORD OF TEMPERATURE, PULSE, AND RESPIRATION.

Name, *Kartick*; Caste *Kurmi*; Age, *35*; Disease *Leprosy*; Date of attack *1902*. Result *19*.

Dates of Observation.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Days of Disease.																														
Temperature Fahrenheit	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.
100°	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.
107°																														
106°																														
105°																														
104°																														
103°																														
102°																														
101°																														
100°																														
99°																														
98°																														
97°																														
96°																														
PULSE PER MINUTE.	M. 72	64	50	64	70	69	64	60	60	64	70	72	70	65	70	70	60	55	80	62	75	55	64	62	66	70	84	68	80	
H. 74	74	92	60	100	76	70	70	70	75	84	80	80	75	75	79	80	64	65	78	80	60	60	68	80	70	89	70	70	60	
RESPIRATIONS PER MINUTE.	M. 18	16	14	16	18	17	16	15	15	16	17	18	17	16	17	17	15	14	18	16	15	16	17	16	18	17	19	17	16	
H. 18	18	18	14	16	18	17	16	15	15	16	17	18	17	16	17	17	15	14	18	16	15	16	17	16	18	17	19	17	16	
BOWELS (No. of stools).																														



## Case I.

## NASTIN B TREATMENT OF LEPROSY—PURULIA LEPER ASYLUM.

December.

## RECORD OF TEMPERATURE, PULSE, AND RESPIRATION.

Name, Kartick; Caste Kurmi; Age, 35; Disease, Leprosy; Date of Attack 1902. Result 19.

Dates of Observation.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Days of Disease.																															
Temperature Fahrenheit 100°	107°	107°	106°	106°	105°	104°	103°	102°	101°	100°	99°	98°	98°	97°	96°	96°	96°	96°	96°	96°	96°	96°	96°	96°	96°	96°	96°	96°	96°	96°	96°
Pulse per Minute	64	70	78	72	70	68	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Respirations per Minute	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Bowels (No. of Stools).	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07

12th Injection at 4 P.M. on 9th December.

13th Injection at 4 P.M. on 16th December.

14th Injection at 4 P.M. on 23rd December.

15th Injection at 4 P.M. on 30th December.























## Case II.]

## RECORD OF TEMPERATURE, PULSE, AND RESPIRATION.

<i>Name, Lin; caste, Tel; age, 35 disease, I, proxy; date of attack, 1900.</i>	<i>Result</i>	<i>Date of Result</i>
		19

[illegible]











## RECORD OF TEMPERATURE, PULSE, AND RESPIRATION.

Name, *Lila*; Caste, *Teli*; Age, *35*; Disease *Leprosy*; Date of Attack, *1900*; Result *;* Date of Result *19*

Dates of Observation.	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Days of Disease.																												
Temperature Fahrenheit																												
108°																												
107°																												
106°																												
105°																												
104°																												
103°																												
102°																												
101°																												
100°																												
99°																												
98°																												
97°																												
96°																												
PULSES PER MINUTE																												
RESPIRATIONS PER MINUTE																												
Stools (No. of Stools)																												











## RECORD OF TEMPERATURE, PULSE, AND RESPIRATION.

Name, *Usaidhoni; caste, Kurmi; age 48; disease Mixed Leprosy; date of attack 1901.* Result Date of Result 190 .

Date of Observation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Days of Disease																																
Temperature	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	
Palmar	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	
Rectal	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	
105°																																
107°																																
106°																																
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103°																																
102°																																
101°																																
100°																																
99°																																
98°																																
97°																																
96°																																
PULSE PER MINUTE.	60	60	100	48	69	74	66	72	64	64	80	100	80	94	80	72	70	64	60	60	60	60	60	60	60	60	60	60	60	60	60	
RESPIRATIONS PER MINUTE.	16	16	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	
Stools																																
Urine																																
Notes																																

11th Injection at 4 P.M. on 29th December.

12th Injection at 4 P.M. on 30th December.

13th Injection at 4 P.M. on 31st December.











## RECORD OF TEMPERATURE, PULSE, AND RESPIRATION.

Name, *Masidhoni*; caste, *Kurmi*; age 48; disease *Mixed Leprosy*; date of attack 1901. Result ; date of result 19 .

Date of Observations.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Days of Disease.																																
Temperature																																
Fahrenheit																																
100°																																

ABSENT.

1st Injection at 4 P.M. on 2nd March.







## RECORD OF TEMPERATURE, PULSE, AND RESPIRATION.

Name Baghu ; caste Kurmi ; age 25 ; disease, Nerve Leprosy ; date of attack, 1903. Result ; date of result 19 .

Date of Observation.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Days of Disease.																														
Temperature Fahrenheit 100°																														
107°																														
106°																														
105°																														
104°																														
103°																														
102°																														
101°																														
100°																														
99°																														
98°																														
97°																														
96°																														
PULSE PER MINUTE.																														
RESPIRATIONS PER MINUTE.																														
Stools.																														











RECORD OF TEMPERATURE, PULSE, AND RESPIRATION.

Name *Babu*; caste *Kurmi*; age, 25; disease, *Nerve Leprosy*; date of attack, 1903. Result ; date of result 19

Days of Disease.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.	Time, A.M.P.M.
Temp. rect.	107°	107°	106°	106°	105°	105°	104°	103°	102°	101°	100°	99°	98°	97°	96°	95°	94°	93°	92°	91°	90°	89°	88°	87°	86°	85°	84°	83°
Pulse	107	107	106	106	105	105	104	103	102	101	100	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83
Respiration	107	107	106	106	105	105	104	103	102	101	100	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83
Remarks																												

1st injection at 4 P.M. on 24th February, 1 C. C. Nartin B.O.



Name Baghu ; Caste Kurni ; Age 25 ; Disease Nerve Leprosy ; Date of Attack 1903.	Result	Date of Result
		19

**Name Baghu ; Caste Kurmi ; Age 25 ; Disease Nerve Leprosy ; Date of Attack 1903.**

## Results

Date of Result

76

[illegible]







NASTIN B TREATMENT OF LEPROSY.  
RECORD OF TEMPERATURE, PULSE, AND RESPIRATION.

Name *Sorola ; Caste, Bauri ; Age 20 ; Disease Mixed Leprosy ; Date of Attack, 1906. Result* Date of Result *191 .*

Date of Observation.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Days of Disease.																														
Temperature	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.
Fahrenheit	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.
100°																														
107°																														
108°																														
105°																														
104°																														
103°																														
102°																														
101°																														
100°																														
99°																														
98°																														
97°																														
96°																														
PULSE PER MINUTE	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.
RESPIRATIONS PER MINUTE	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.
REMARKS (No. of Scales)																														

7th Injection 3 C. C. Kaly at 4 P.M. on 4th November.

8th Injection at 4 P.M. on 18th November.

9th Injection at 4 P.M. on 25th November.



RECORD OF TEMPERATURE, PULSE, AND RESPIRATION.

December.

Name *Sorola; Caste Bauri*; Age *20*; Disease *Mixed Leprosy*; Date of Attack *1906*. Result

Date of Result

19

Dates of Observation.	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Days of Disease.																															
Temperature Fahrenheit	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.
107°																															
105°																															
106°																															
104°																															
103°																															
102°																															
101°																															
100°																															
99°																															
98°																															
97°																															
96°																															
PULSE PER MINUTE.																															
RESPIRATIONS PER MINUTE.																															
BOUNDS (No. of Stools.)																															







## RECORD OF TEMPERATURE, PULSE AND RESPIRATION.

*Name Sorola; Caste Bauri; Age 25; Disease, Mixed Leprosy; Date of Attack, 1906.*

### Results

19 :

Date of Result

Dates of Observation.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Days of disease.																																
Temperature	Fahrenheit	100°																														
		107°																														
Pulse	Per minute	108°																														
		105°																														
Respiration	Per minute	104°																														
		103°																														
Stools	No. of	102°																														
		101°																														
Urine	Per minute	100°																														
		99°																														
Sweat	Per minute	98°																														
		97°																														
Blood	Per minute	96°																														
		95°																														
Remarks.		<p>16th injection at 4 P. M. on 24th February.</p> <p>17th injection at 4 P. M. on 2nd March.</p>																														

ANALYSIS OF THE AGENT OF VERBOSITY.















## RECORD OF TEMPERATURE, PULSE AND RESPIRATION.

Name, Badoi; Caste, Gouda; Age, 38; Disease, Mixed Leprosy; Date of Attack 1908. Result

Date of Result

67.

[illegible]



## RECORD OF TEMPERATURE, PULSE AND RESPIRATION.

Name *Badoi*; caste *Gorala*; age 38; disease, *Mixed Leprosy*; date of attack 1908.

Result

Date of result

191

Dates of Observation.	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	1	2	3	4	5	6	7	8	9	10	11
Day of Disease.																															
Temperature	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.	Time.
Fahrenheit	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.	A.M.P.M.
108°	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78
107°	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76
106°	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74
105°	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
104°	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
103°	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68
102°	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66
101°	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64
100°	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62
99°	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
98°	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58
97°	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56
96°	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54
PULSE	75	55	30	60	70	60	70	60	60	60	58	50	60	58	58	60	70	70	65	80	80	80	71	80	80	70	60	80	70	80	70
PER MINUTE	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.
RESPIRATIONS	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
PER MINUTE	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.	E.
BOWELS (No. of Stools)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

10th Injection at 4 P.M. on 24th February

8th Injection at 4 P.M. on 18th February 1910.

11th Injection at 4 P.M. on 2nd March

12th Injection at 4 P.M. on 10th March 1910.









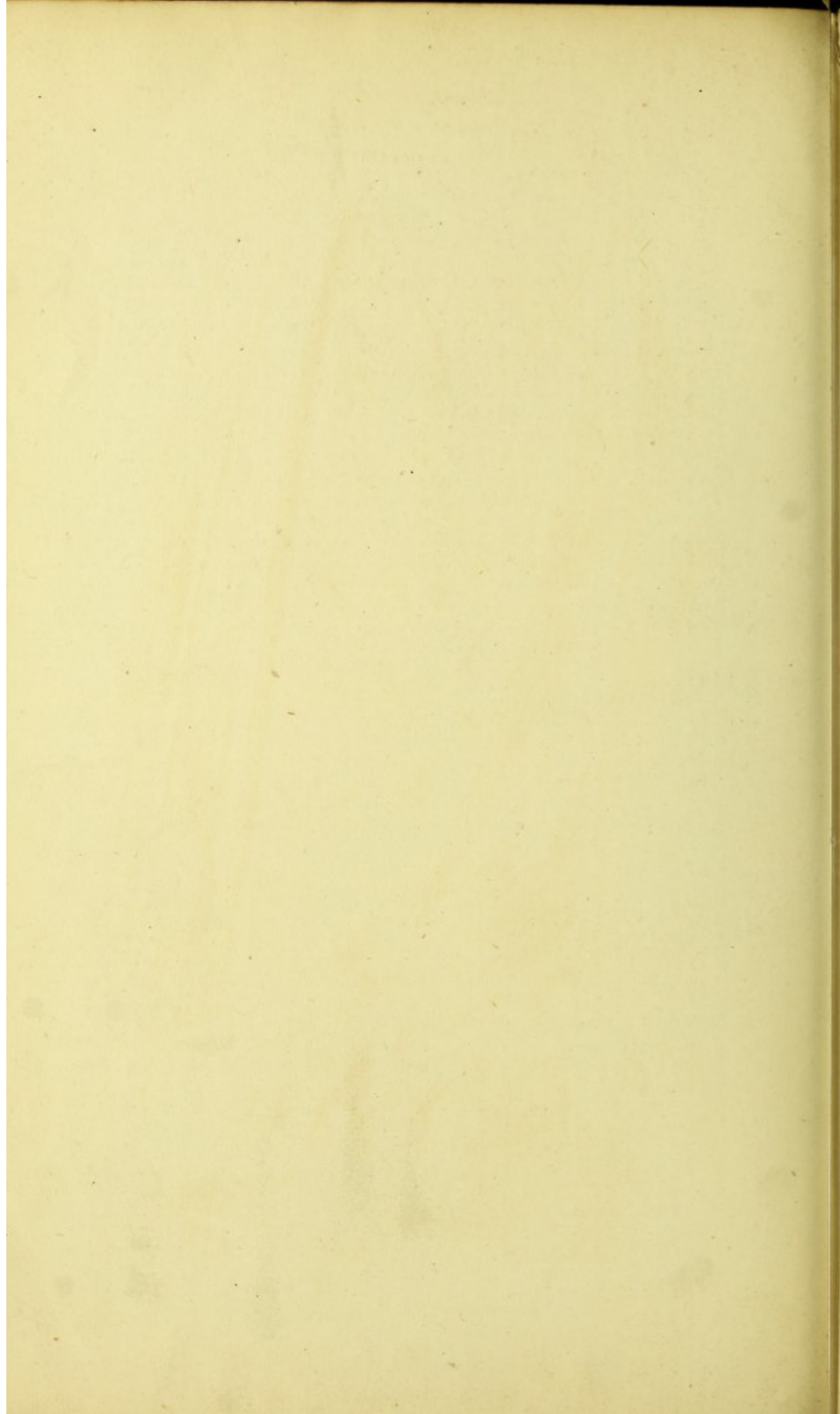




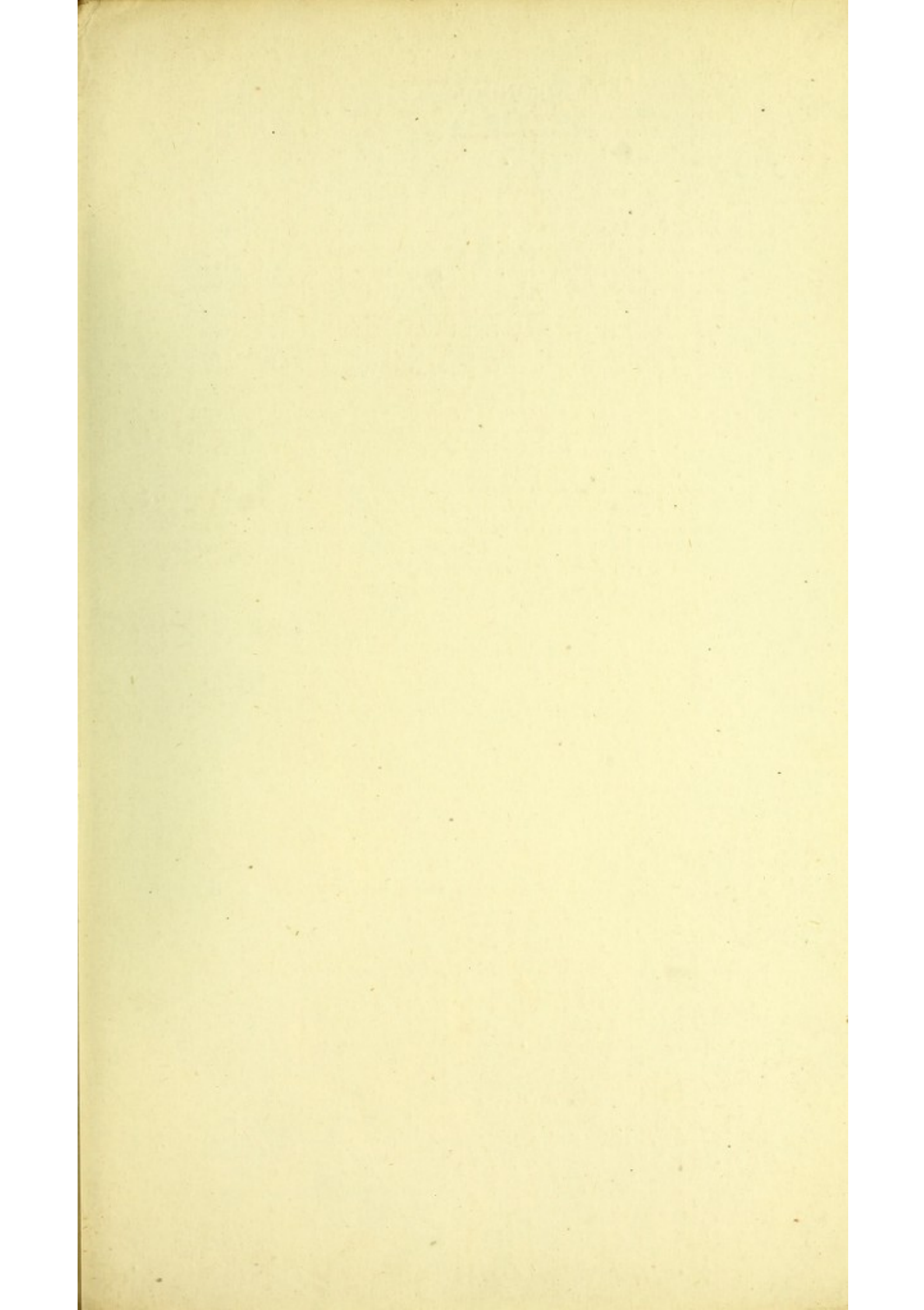














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