

The Tallerman-Sheffield patent localized hot-air bath : being a new invention for the treatment of rheumatism, gout, rheumatic arthritis, stiff and painful joints, sprains, etc., etc., by the local application of super-heated dry air : with notes of cases treated at St. Bartholomew's Hospital, North-West London Hospital, Charing Cross Hospital, St. Mary's Hospital, The Royal Portsmouth Hospital, and elsewhere.

Contributors

Willetts, Alfred (Contributor)
Tallerman, Lewis A.
Royal College of Physicians of London

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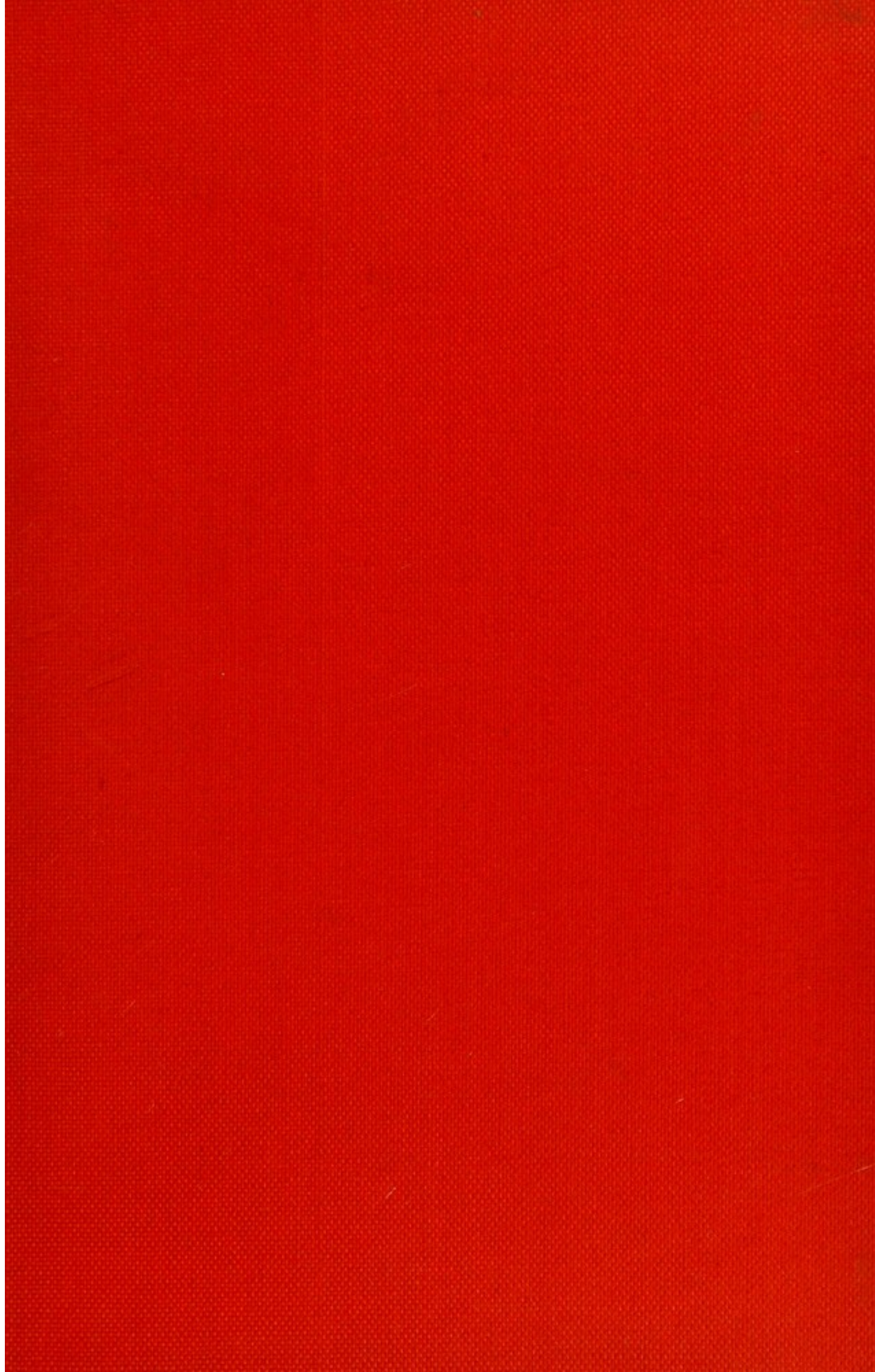
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THE TALLERMAN-SHEFFIELD

PATENT

LOCALIZED HOT-AIR BATH :

BEING

A New Invention for the Treatment of Rheumatism,
Gout, Rheumatic Arthritis, Stiff and Painful
Joints, Sprains, etc., etc.,

BY THE

LOCAL APPLICATION OF SUPER-HEATED DRY AIR.

WITH NOTES

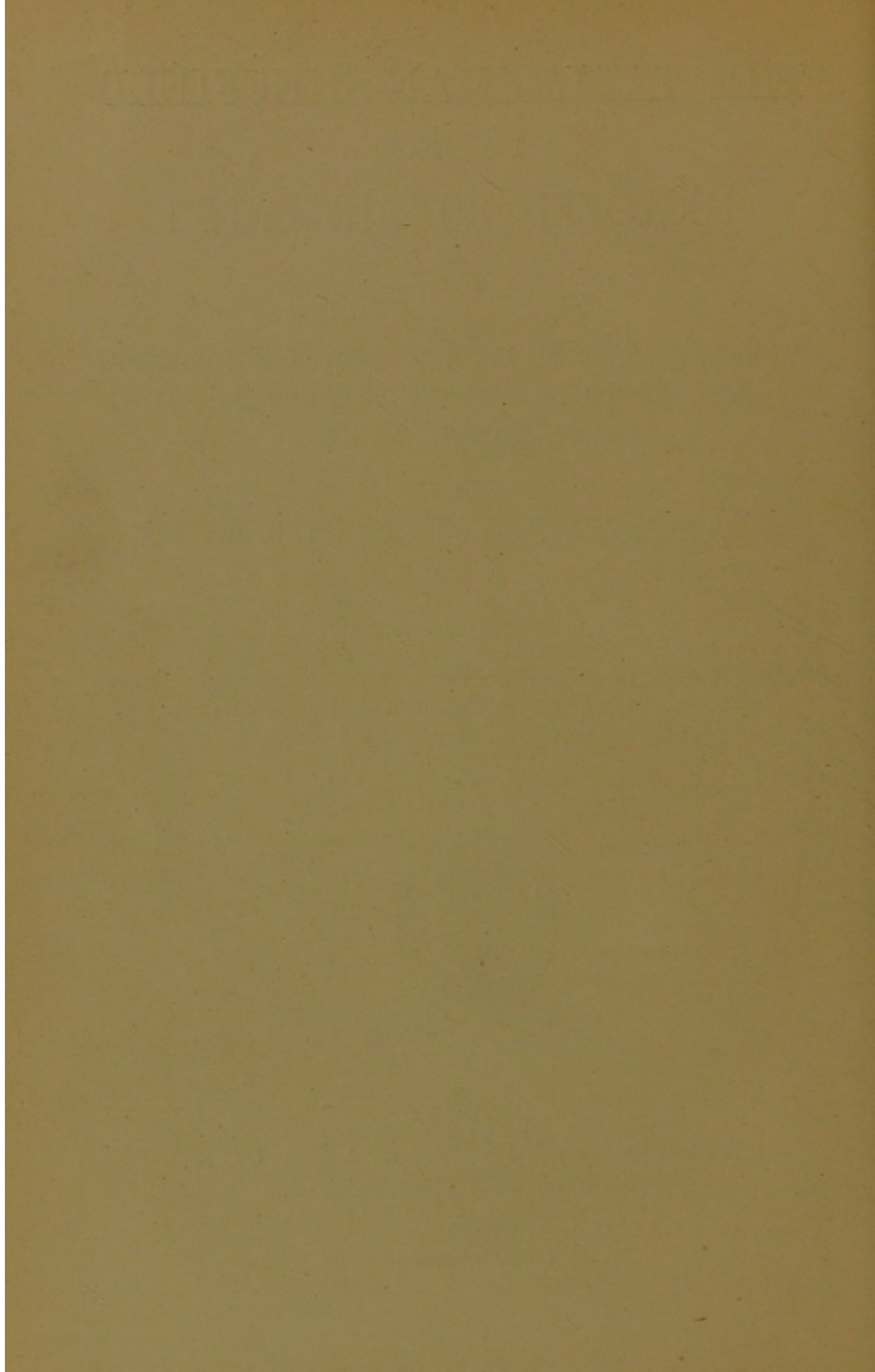
OF CASES TREATED AT ST. BARTHOLOMEW'S HOSPITAL, NORTH-WEST LONDON
HOSPITAL, CHARING CROSS HOSPITAL, ST. MARY'S HOSPITAL, THE
ROYAL PORTSMOUTH HOSPITAL, AND ELSEWHERE.



LONDON :
BAILLIÈRE, TINDALL AND COX,
KING WILLIAM STREET, STRAND.

1896.

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PREFACE.

THIS pamphlet has been prepared in response to numerous requests for further information respecting the Tallerman-Sheffield Patent Hot-Air Bath. The attention of the reader is directed to the fact that the bath has been brought forward solely under the auspices of the medical profession, in whose hands it has been unreservedly placed for trial. It has been thoroughly tested during the last two years in a large number of cases, selected for their exceptional severity, at the following hospitals: St. Bartholomew's, the North-West London, Charing Cross, St. Mary's, the Great Ormond Street Children's Hospital, the Royal Portsmouth Hospital, and others, and it has been warmly approved by medical men of the highest standing as a most valuable appliance, not only far in advance of anything else of the kind, but practically constituting a new departure.

At St. Bartholomew's Hospital, Mr. Alfred Willett, F.R.C.S., after a careful trial in the wards, considered it of sufficient importance to form the subject of a clinical lecture, delivered by him on May 23, 1894, and his approval has since been completely justified by the brilliant results obtained elsewhere.

Particular attention is drawn to the remarkable success of the apparatus in cases of *Rheumatic Arthritis* of long standing, and deemed incurable, after the failure of every other known remedy; to the rapid recovery effected by it in acute *Gout* and severe *Sprains*; to the immediate relief

from pain which it affords; to its powerful effects on *Stiff* and *Painful Joints*; and to the absolutely safe and painless character of the treatment.

The advantages of a rapid and efficient method of treatment at home, instead of a long, expensive, and often disappointing 'course of waters' at some foreign health resort, will be fully appreciated by vast numbers of sufferers from rheumatic and gouty affections, and particularly by busy professional men.

At the request of several medical gentlemen, an institute has been opened at 50, Welbeck Street, where patients are received for treatment under the direction of their own medical attendant. Patients are not treated without a medical recommendation.

Terms and further particulars may be obtained at the Institute, or of the Secretary,

MR. M. ST. B. PRICHARD,
1 and 2, Chiswell Street,
Finsbury Square.

September, 1895.

THE TALLERMAN-SHEFFIELD HOT-AIR BATH.

INTRODUCTION.

THE Tallerman-Sheffield Patent Hot-Air Bath is a new method of applying heat locally to the treatment of disease and the relief of pain. The most important feature of the invention is the use of perfectly *dry air*, which enables a much higher temperature to be applied to the part affected than has hitherto been possible with correspondingly powerful results. Heat has always been recognised as one of the most valuable therapeutic agents which Nature has placed at our disposal, and various means have been devised for employing it both locally and generally in the service of medicine and surgery. The bath, the fomentation, the hot bottle, and the poultice, are instances familiar to everybody; but, indispensable as these things are, their efficacy is necessarily limited by the comparatively low temperature which is all that can be borne when applied by ordinary means. Hot water becomes painful at about 115° Fahrenheit, and vapour or steam cannot well be borne above 120°; whereas it has been ascertained by experiment that hot air, when dry, can be tolerated up to 300°, and even higher. Attempts have accordingly been made to utilize this fact by so-called hot-air baths of different kinds, of which the best known is the hot chamber (*calidarium*) of the Turkish or Roman bath. In this, of course, the hot air is breathed, but portable baths have been tried in the form of a box,

with an aperture for the head, while the air inside is heated by a lamp, thus avoiding the disadvantage of making the patient inhale the superheated atmosphere to which it is desired to subject his body. Similar appliances on a smaller scale have also been used for single limbs. But the difficulty has always been to make the high temperature a reality. Either the construction of the apparatus will not permit a high temperature to be obtained at all, or the air is not really dry, and therefore a high temperature cannot be borne when obtained. The air may be dry at first, but as soon as the skin begins to perspire it becomes more or less charged with moisture until the perspiration, which is excessive in the hot-air bath, can no longer evaporate freely, with the result that discomfort at once ensues and the proceeding has to be abandoned. Thus it happens that the hot chamber of the Turkish bath is practically limited to a temperature of about 170° . Even a single limb cannot be exposed to a really high temperature in an ordinary closed chamber for more than a few minutes, for the simple reason that the perspiration resting on the skin has a scalding effect when 200° or less is reached.

DESCRIPTION OF THE BATH.

These difficulties are completely overcome by the Tallerman-Sheffield apparatus, in which a temperature of from 250° to 300° or more can be borne for an indefinite time, not only without discomfort, but with a sensation of pleasure. The secret lies in an ingenious arrangement for keeping the air really dry. The apparatus consists of a copper chamber, varying in size and shape according to the part which it is desired to treat, but generally taking the form of a cylinder. The hand, the forearm, or the whole arm, including the shoulder, may be placed in it; and similarly with the lower extremity—the foot, the knee, and the hip may be treated. The hip-bath may also be applied to the abdomen and other parts of the trunk. The limb

to be treated is passed into the open end of the cylinder through an airtight curtain, which is afterwards secured in such a way as to close the chamber completely. The distal end of the cylinder is furnished with an ingenious arrangement, which plays an important part in keeping the air dry.

The heat is supplied externally by gas-jets. Oil could be used where gas is not laid on, but the latter is more convenient. The stand on which the cylinder rests is supplied with rows of gas-burners, which can be connected with any ordinary gas supply by a piece of rubber-tubing, and turned up or down according to the degree of heat required. The bath can therefore be used in any private house, under the care of the patient's own medical attendant.

The temperature is indicated by a thermometer, the bulb of which is inside the cylinder, at the level of the limb to be treated, while the scale passes outside, and can be read off at any moment by a glance. The cylinder is also furnished with a double stopcock, which can be connected with an air-pump, and used either for drawing off heated vapour or admitting medicated vapour.

METHOD OF USING THE BATH.

The limb to be treated rests at the bottom of the cylinder on a metal cradle protected by asbestos, which prevents all danger of scorching the skin by contact with the heated metal. The patient may lie in bed or be seated in an armchair during treatment, whichever is considered most comfortable or suitable to the case. The most convenient way of using the bath is to heat the cylinder up to 150° Fahrenheit before inserting the limb, and then gradually raise the temperature, the process of drying the air being frequently repeated, which enables the patient to bear exposure to 250°, 300°, and even higher, without the least discomfort. This striking result is clearly due to the system of ventilation employed, because each time

it is brought into play a considerably higher temperature can be borne without incommoding the patient, until the air again becomes charged with moisture evaporated from the skin. The plan for keeping the air dry is the most distinctive and valuable feature of the Tallerman-Sheffield bath, although in other respects it is a much more complete, reliable, and convenient apparatus than anything else of the kind yet brought forward.*

The temperature found most suitable for treating the majority of cases ranges from 240° to 280° ; and the duration of an ordinary sitting is from thirty minutes to one hour, but it may be prolonged to two hours or more without discomfort or ill-effect.

EFFECTS OF THE BATH.

The chief physiological effects of the bath are as follows:

- (1) Profuse perspiration of the part treated, as in the Turkish or vapour-bath, but more copious in proportion to the higher temperature applied, and the greater length of time it can be borne (patients have been treated experimentally for upwards of two hours at 240° to 250° F. without any ill effects excepting lassitude on the following day).
- (2) Greatly increased flow of blood in the skin and subcutaneous tissues, and in the whole part treated.
- (3) Softening and relaxation of the tissues.
- (4) General perspiration over the whole body.
- (5) General raising of the temperature of the blood by one or two degrees.

The therapeutic effects include the following:

- (1) *Relief from Pain*.—This is very remarkable in both acute and chronic conditions, and it is not confined to the

* The late Dr. Bell Hunter, the eminent authority on hydrotherapeutics and medical superintendent of Smedley's hydropathic establishment, Matlock, writing under date March 18, 1894, observed: 'We have our hot-air baths, and with arrangements for local application of the heated air. Your apparatus is a great advance on these in precision of working and extent of range of temperature, however, and I am not unwilling to give it the welcome I can see it deserves.'

part treated. In rheumatic affections, for instance, not only the opposite limb, but other parts of the body, are often relieved at the same time. In acute inflammatory conditions, especially of the joints, the anodyne effect is striking. Patients suffering the severest pain become quite easy after half an hour's exposure, and not infrequently sink into a comfortable sleep.

(2) *Reduction of Inflammation.*—The absorption of inflammatory products is promoted in a marked degree, and a healthy condition restored with surprising rapidity. Cases of sprain and other injury, which might be expected to run a long and tedious course, are cut short.

(3) *Increased Mobility in Stiff and Painful Joints.*—The range of motion is not affected, of course, in cases of bony ankylosis, but the case of S. C., treated at the Royal Portsmouth Hospital under Mr. Ward Cousins, demonstrated that adhesions yield with very little pain after treatment in the hot-air apparatus. In severer cases, where the adhesions are of so firm a character that there would be some hesitation about breaking them down under an anæsthetic, owing to the probability of recurring stiffening, it is of a special value to the surgeon.

To use Mr. Willett's words, 'Movements that excited pain before can be performed after the limb is placed in the bath without pain. Again, in cases of breaking down of adhesions under gas, the patient is in great pain afterwards; but let the limb be placed in the heated cylinder, and the pain is greatly lessened, as also is the secondary stiffness due to extravasation and inflammation round the torn tissues.'

(4) *Elimination of Morbid Products.*—There is reason to believe that the profuse and prolonged perspiration, combined with the great increase of circulation in the subcutaneous tissues, which are promoted by the dry-air bath, effect the removal of morbid products by exudation in gouty and rheumatic cases much more completely than any other process. In short, all the effects of heat are obtained in a heightened degree.

DISEASES AND AFFECTIONS TREATED.

Detailed notes of cases that have been treated, mostly in first-class hospitals, are given further on. These cases include the following affections: *Rheumatic arthritis, gout, acute inflammation of joints, sprain, stiff and painful joints after inflammation, stiff joints after injury, gonorrhœal rheumatism, chronic ulcer, flat-foot.*

These are nearly all affections of the joints, it will be observed, and in themselves offer an immense field of practical utility; but the bath is obviously applicable to many other conditions in which heat is indicated, either for the relief of pain or for promoting absorption. Thus it might be used in thrombosis and phlebitis of the lower extremity, sciatica, poisoned wounds, lymphangitis, some skin diseases, and other local affections of either extremity. It could also be easily applied to the pelvis by a slight extension of the form of apparatus already successfully used for the hip-joint (see p. 23), and it should certainly prove valuable in many troubles affecting that part of the body. It seems to be particularly indicated, for instance, in amenorrhœa, dysmenorrhœa, and other ovarian troubles. Mr. Willett suggests that it should be tried by physicians in selected medical cases (p. 50)—and the success already obtained in that direction has been most encouraging. In short, a very wide field of usefulness is open to the invention now that its efficacy has been conclusively proved.

Among the diseases already treated with success particular attention is directed to *rheumatic arthritis*, one of the commonest, most painful, and most intractable affections which medical men are called upon to deal with in this country. As Mr. Jonathan Hutchinson has said in a recent clinical lecture (*Clinical Journal*, May 29, 1895): 'England is the home of rheumatic gout; no place beats it excepting Ireland.' And common as it is, the previous means of treating it are universally admitted to

be most unsatisfactory. 'In a severe case,' Mr. Hutchinson continues, 'it must be admitted that the prognosis, under the ordinary conditions of life in England, is a gloomy one.' The malady is aggressive, and as one joint stiffens after another the patient is in great danger of becoming a hopeless cripple, to die eventually a lingering and painful death, worn out by constant suffering. In the same lecture Mr. Hutchinson recognises that the application of heat is a measure of great importance in such cases, and therefore a new method of applying heat in a far more perfect and efficient form than has hitherto been attained cannot fail to be welcomed. Both medical men and sufferers will read with interest the details that follow of cases in which the Tallerman-Sheffield bath has been used in rheumatic arthritis of the severest kind. Stiff and painful joints form another extremely common and unsatisfactory class of cases which have been treated with equal success. The notes are in all cases supplied by the medical men under whose direction the treatment has been carried out, and whose names are an absolute guarantee for the reliable character of the information.

The report of the North-west London Hospital on the cases treated experimentally in their wards is as follows:

'The authorities of the North-west London Hospital, having at the suggestion of Mr. Mayo Collier kindly consented to submit a series of cases to treatment by the local and medical dry-air bath, the proprietors of that apparatus courteously placed one of their cylinders at the disposal of the medical staff for that purpose, and I give the notes and results obtained during the past two months.

'It might not be out of place to refer here to the fact that this apparatus was introduced to the medical profession by Mr. Willett at St. Bartholomew's Hospital, in the wards of which institution a variety of cases were treated for two months, after which Mr. Willett detailed the results obtained in a clinical lecture delivered on Wednesday, May 23 last.

‘ Acting upon the suggestions thrown out by the lecturer on that occasion, several medical cases were treated.

‘ The operation extends over forty minutes, at an average temperature of from 240° F. to 260° F., and may be shortly described as follows: The affected part is placed in the cylinder, which to save time has been already heated to a temperature of 150° F., and is then gradually raised.

‘ The system of heating and ventilation admits of the air in the cylinder being kept practically dry throughout the operation, thereby enabling a very high temperature to be borne by the patient; in one instance, at St. Bartholomew’s Hospital, reaching 300° F., whilst temperatures from 270° F. to 280° F. are by no means unusual.

‘ Under treatment patients experience a sense of comfort, probably due to the high temperature exercising an anodyne influence which relieves the pain, or more often removes it entirely; even when adhesions have been broken down, the pain is much modified if the joint is immediately subjected to treatment.

‘ Some of the cases can hardly fail to be of interest, being of that chronic character for which so little can be done by ordinary medical treatment. All of them were selected for their severity, in order to test to the utmost the value of the apparatus; the majority were cured, and the remainder exhibited such marked improvement that it is only fair to state that there was not a single failure.

‘ Mr. Tallerman kindly gave his personal attention during the treatment, and Mr. Mayo Collier supervised the selection of cases.

‘ J. F. SARGEANT, Res. Med. Officer.’

The case notes are followed by extracts from a clinical lecture on the Tallerman-Sheffield bath delivered by Mr. Alfred Willett, F.R.C.S., Surgeon to St. Bartholomew’s Hospital.

NOTES OF CASES

TREATED BY

THE TALLERMAN-SHEFFIELD PATENT LOCALIZED HOT-AIR BATH.

RHEUMATOID ARTHRITIS.

CASE I.

*Treated at the North-west London Hospital. Under the
care of MR. MAYO COLLIER, F.R.C.S.*

A. C.; aged 64. Dressmaker. Chronic rheumatoid arthritis of four years' standing; both knees, shoulders, and wrists and all finger-joints affected. Patient had been under hospital treatment for four years without improvement—four months at University College Hospital, and two years at the North-west London Hospital. On examination all the finger-joints were found to be enlarged and painful, and there was great limitation of movement, patient not being able to flex the fingers on the palm. The movement of both wrists was limited and painful; the right elbow was fixed at a right angle, and any attempt at movement caused great pain. Both knees and shoulders were enlarged and painful, and distinct grating could be heard on movement.

This patient was first treated in the hot-air cylinder on August 10. After the first operation it was noticed that the pain was considerably less, and the joints showed marked improvement.

After the fourth operation the patient, who had been unable to work at her business for eighteen months, was again able to use her needle.

After the fifth operation the right arm could be fully extended without pain, and with a little pressure the fingers could be flexed on the palm. The left hand and arm also showed marked improvement, although they had not been treated in the cylinder.

After the eighth operation, with the exception of the forefinger, in which a little stiffness still remained, all the fingers closed readily.

On August 24, after the ninth operation, the patient reported having resumed her former occupation of dressmaker, and her ability to walk up and down stairs without pain.

The average length of each operation was forty minutes.

Note.—This case of chronic rheumatoid arthritis had been under continual medical supervision from its outset, and the usual remedies were applied. Its history shows that so far from yielding to treatment, the disease made rapid strides, so much so that, whereas eighteen months ago the patient was able with some effort to follow her occupation of dressmaker, twelve months later she was incapacitated from even feeding or dressing herself.

The improvement wrought by the local and hot dry-air cylinder was as immediate as it was remarkable. The progress of the disease was arrested, and a curative process was set up at the first operation, which became more manifest with every succeeding one, proving beyond doubt the value of the treatment in cases of this nature.

J. F. SARGEANT, M.R.C.S., M.R.C.P.

CASE II.

Treated at the North-west London Hospital. Under the care of MR. MAYO COLLIER, F.R.C.S.

G. S.; aged 71. Carpenter. Chronic rheumatoid arthritis of twelve months' standing. Both elbows and all the joints of the fingers were stiff and painful, so much so that it was with the greatest difficulty that he continued his work as carpenter. After five operations the improvement in this case, both as to pain and stiffness, was so marked that he was enabled to go to his work without inconvenience.

Note.—The result of the treatment in this case was quite as satisfactory as in the preceding one.

J. F. SARGEANT, M.R.C.S., M.R.C.P.

CASE III.

Treated at St. Peter's Home, Kilburn.

Miss H.; aged 45. For seven years suffering from chronic rheumatic arthritis, which had made her incapable

of almost any movement in the hands and arms. After a course of your baths she can now feed herself, and is certainly wonderfully better.

W. D. WATERHOUSE, B.A., LL.D., L.R.C.P.I., etc.

CASE IV.

Treated at the Royal Portsmouth Hospital. Under the care of MR. D. WARD COUSINS, F.R.C.S.

Miss M. suffered from rheumatoid arthritis for some years, being a complete cripple. Knees and elbows stiff, and considerable deformity of the hands, especially the left, which is distorted and useless, the fingers being all flexed and stiff, and any attempt at movement causing severe pain. Unfortunately the patient was unable to undergo full course of treatment; but the results of treatment after two applications of the cylinder were most encouraging. The fingers became more movable and less painful. The little and ring fingers, which had been absolutely stiff and rigid before the treatment, became pliant, and could with perseverance be almost straightened.

T. H. BISHOP, M.B., C.M., House-Surgeon.

H. W. MORLEY, M.R.C.S., L.R.C.P.

CASE V.

Mrs. E. N. G.; aged 31.

History.—Synovitis right knee at 14, left knee at 18, and right wrist at 21, after fall while skating.

Patient's joints, which had been gradually stiffening with much pain during pregnancy, became much worse after her confinement, and left patient entirely crippled and confined to her couch.

Patient states that notwithstanding she availed herself of the advice of several eminent physicians, the disease made rapid strides, and last February found her with both elbows rigidly fixed at an angle of 45° , unable to raise her hand to her face. Jaw very stiff, hardly able to chew; both hip-joints rigid, knees also, with inversion and rotation of the left leg. The thumbs were rigid, and there was no movement at the wrists, and the phalanges bent, so that the hand looked like a bird's claw through the rigidity of the fingers. She was absolutely helpless, and reduced to a skeleton through pain and want of sleep. Most violent palpitation of the heart, with frequent diarrhœa.

The patient, who is evidently of a highly neurotic

temperament, then adopted the Salisbury treatment, and at the end of nine months exhibited marked improvement in her joints and condition, the patient digesting well and thriving.

The case was then considered to be one of those which might be treated with advantage by the superheated dry-air cylinder, Tallerman-Sheffield patent, and a course of twenty baths was prescribed. After which, on examination, it was found patient's knees had extended, and were no longer rigid in one position. The hips are quite flexible, the patient being able to sit on her bed and swing her feet backwards and forwards. She can grasp the head of her bed over her head, do her own hair, hold and raise a cup to her lips. She is bright and cheery, and looks forward with hope to having the power to walk restored to some extent.

The local hot-air baths have quickened her movements and markedly relieved general pain; they have improved her sleep and digestion, and rendered possible the movement of joints which appeared absolutely rigid.

Temperature in this case varied during the application of the bath from 99.8° , after fifteen minutes, to 100.4° , temperature at commencement being normal.

Since returning to the country the patient reports herself as much better, and that her muscles are steadily increasing in power and freedom of action. She is able to sit up for meals, which she has not done for three years.

ARCHIBALD KEIGHTLEY, M.D., L.R.C.P.

CASE VI.

Miss N. M.; aged 24.

History.—Always weak health; never as strong as the other members of her family, who enjoyed good health. Father not alive—died of consumption.

No trouble with joints till aged 17, except slight stiffness during school life. Nothing noticed until after a dance, when there was great muscular stiffness and some swelling of the joints. Power of movement gradually diminished. Last winter caught cold, which developed weakness in lungs; this was associated with some degree of anæmia. Went to Riviera, where the joints became decidedly worse, and there was no special improvement in the lungs.

Condition in May last.—Lungs, considerable cough (no bacilli), no cavity; some dulness over middle sub-clavicular region on left side. Right ankle stiff, swollen, and painful. Right knee almost rigid, swollen and painful, especially at night. Patella apparently fixed by fibrous ankylosis. This knee was the size of a small cocoanut. Hip is free. Left knee could not be fully extended. The tendons at the inside are rigid and painful, and patella moved very stiffly, with pain on attempting to move it. The swelling was slight, though on each side of the patella there was a 'doughy' feeling on pressure. Left hip free. Shoulders are both free. Both elbows stiff and rigid, very slight swelling. Wrists are enlarged and stiff. Thumbs are stiff and painful. All phalangeal joints are slightly enlarged and flexed. Strictly dieted on meat, very little bread and a little fruit. Oil and a little cinchona.

October 3, 1894.—General health greatly improved. Less pain, better digestion and sleep. Right knee less swollen and painful; rather more pain in left knee; the wrists also were reduced, but the power of supination and pronation had much diminished.

Patient was then advised to take the Tallerman-Sheffield Superheated Dry-Air Baths, and a course of twenty was taken.

Though of a very neurotic temperament, the patient has received much benefit. Almost all the power of pronation and supination has been restored to the right arm. The right elbow is much less stiff, and moves with fair freedom throughout. The left elbow is less stiff, but pronation and supination only slightly improved. The phalangeal joints are free, though still slightly swollen. The ankles are free. The right knee, though stiff, can be flexed and extended, and the patella is freely movable. The removal of swelling is especially marked in the case of the right knee. The left knee is much more free, very much less painful, and the swelling has almost disappeared. The knees are most markedly improved the moment they are subjected to the hot air. If they are flexed and pain is found on extending, ten minutes' exposure to the hot air enables them to be almost entirely extended without pain.

Great difficulty was experienced with this patient because the action of the skin on both legs was almost entirely absent. Since this action has been restored, the beneficial effect of the baths has been much more marked on the knees. There was no difficulty in this respect as regards

the body and arms, the joints of which received marked benefit from the first.

The patient, who for three months has been unable to even stand, is now able to walk several times across the room with very little support.

The baths have also had considerable effect in improving the condition of the left lung.

Temperature, always normal at first, varies from 99.4° at commencement to 100.2° .

ARCHIBALD KEIGHTLEY, M.D., L.R.C.P.

CASE VII.

Miss C. C.; aged 54. Suffering from chronic rheumatoid arthritis. All joints affected except the temporo-maxillary, and all those affected rigidly fixed except the left elbow, which is freely movable, and the right elbow, which admits only of limited extension and flexion.

This condition is the outcome of twenty years' suffering, the first onset being an attack of acute rheumatism, from which only a partial recovery was made, succeeded at a short interval by a second attack, from which time more or less pain has always been present with a sub-acute exacerbation from time to time, and the loss of function of one or more joints till now. *The above condition of utter helplessness has been reached attended always by a constant gnawing pain, increased to acute agony when any movement whatever is attempted.*

A trial was made on November 19 of the Tallerman-Sheffield Local Dry-Air Bath, the right arm being inserted, whilst the rest of the body was wrapped in blankets. The operation occupied one hour, during which *the pain almost entirely disappeared*. There was a general profuse perspiration, having a pungent characteristic odour. The temperature of the body as taken in the month gradually rose from 98.2° to 100° . Pulse rose from 96° to 116° .

On the arm being drawn from the bath there was some passive movement in many of the smaller joints of both hands and more freedom of movement in both elbows, the right now admitting of some degree of pronation and supination, whilst that of flexion and extension was increased.

A good night was passed, and next day the patient said that she was 'much lithesomer,' and was able to stand without support, whilst her attendant said that she was lighter to lift and very much easier to nurse.

Some improvement accrued after each bath, which was most noticeable in the feet and legs, the latter, before operations were begun, being rigid and firmly approximated to each other, whilst after the fourth bath they could be separated at the ankles to the extent of ten inches.

The temperature was carefully taken in the mouth every fifteen minutes during the bath, and found to rise uniformly, one degree in the hour, and to fall to normal after the operation had been completed ten minutes.

Unfortunately, it was only possible to treat this patient four times, as Mr. Tallerman, who was good enough to superintend the operations, was prevented by his engagements from prolonging his stay at Southport.

J. G. G. CORKHILL, M.B., L.R.C.P., etc.

CASE VIII.

Miss E. R. ; aged 21 years. No family history of rheumatism or allied diseases.

1890.—In 1890 first contracted disease in Germany. Returned to England and underwent a course of treatment at Buxton. Got much worse, and was unable to walk. Wintered in Manchester. Adhesions in right elbow and one finger-joint broken; no passive movement was performed after operation.

1891.—Went to Aix-les-Bains; took waters and baths; slight temporary improvement.

Spent summer in Liverpool; treated by splints; got worse; many joints fixed.

Spent the autumn at Grange-on-Sands; got rapidly worse.

In December went to Egypt; slept in damp bed on board ship; arrived in Alexandria in agony with sciatica and pain in various joints.

1892.—Stayed in Alexandria two to three months.

In April went to the sulphur baths of Helouan, near Cairo, for one month; slight improvement. Returned to Cairo; stayed two months; got worse again, and was unable to move or to sleep except in one position in a chair.

In August returned to Europe; took another course at Aix-les-Bains; stayed till end of September; got weaker, however, and was crippled in almost every joint.

In October returned to England. Dr. G. saw her at

Charing Cross Hotel, and pronounced her case perfectly hopeless.

1893.—Underwent a course of special diet.

1894.—In January I first saw Miss E. R. at Brighton, and heard that her bodily condition had greatly improved under the special diet, that she had gained flesh, and was comparatively free from pain.

On examination found the following joints affected: Right knee still enlarged, and leg flexed on thigh at an angle of about 130° . Left ankle firmly fixed; also right hip, the thigh being rotated inwards and adducted so that the left knee rested on right thigh. The fingers of both hands all more or less fixed and deformed. Left wrist quite stiff; right wrist partially so. Right elbow quite fixed at an angle of 90° ; left elbow allowed slight movement. There was decided tilting of the pelvis, the right brim being nearly four inches below the left, and there was double curvature of the spine.

In February, under an anæsthetic, broke down adhesions in left hip.

This was followed by intense pain, resembling sciatica, for a fortnight. Passive movement was commenced on second day, but accompanied by great pain.

Movements by no means free, and I broke down more adhesions under gas. This caused a renewal of the pain for a few days, but the result was fairly satisfactory, as the legs could now be separated; there was considerable power of flexion and extension, the tilting of the pelvis was much lessened, and the curvature of the spine almost disappeared.

Miss E. R. returned to Brighton, and remained there until October, during which time she greatly improved.

In November, patient commenced the first course of treatment under the Tallerman-Sheffield Localized Hot-Air Baths. After two preliminary baths to the left arm, I operated on November 26 on the elbow and other joints, and loosened as far as possible the adhesions, paying most attention to those about the elbow-joint.

As soon as the patient recovered consciousness she complained of great pain, but this was quickly relieved when the arm was placed in a hot-air bath; and after remaining in the bath for forty minutes, the arm was taken out and passive movement permitted.

The baths were continued every day for ten days at temperatures first of 230° F., afterwards 240° and 250° , and finally at 260° .

At no period did the patient experience any pain or uncomfortable sensation from the high temperature.

As the hip-joint had again become rigid—although in a better position than formerly—I prescribed an interval of rest, to ascertain the permanency of the benefit derived before subjecting the patient to further treatment.

1895.—After five months and a half, I found that the condition of the elbow was extremely satisfactory, the patient being able to move her arm freely and without pain, and could lift a weight of 35 lbs. I therefore determined to try the effect of the hot-air bath on the hip.

On May 16 and 18 patient had two preliminary baths before operating on the hip, which was now almost rigid again and strongly adducted, and the left pelvic brim was about 2 inches higher than the right.

On May 20, assisted by Drs. Hewitt and Bolus, I broke down (with considerable difficulty) the adhesions until perfectly free movement was capable of being made in every direction.

On recovering from the anæsthetic the patient was placed in the hip-bath, the temperature being gradually raised from 170° to 235° .

The patient complained of very little pain—only of aching—and after being in the bath for fifty minutes I was able to perform all the movements I had previously done under an anæsthetic.

During the night the patient had very little pain, and on May 21 had another bath, after which passive movements—more rapid than on the previous day—were performed.

The patient had a restless night, but this was most probably due to the catamenia, which appeared on the morning of May 22. The patient could not therefore have a bath, but she was able to move her limb in every direction without pain.

The case is still under treatment.

F. A. BARTON, M.R.C.S.

CASE IX.

Treated at St. Mary's Hospital, London, W. Under the care of MR. HERBERT W. PAGE, F.R.C.S.

W. H.; employé, G.W.R. The patient was a man who had rheumatism of many joints after exposure to cold ;

one knee was left swollen, painful, and crippled, and the patient was confined to his bed.

On November 14, 1894, the patient was first treated in the hot-air bath for forty-five minutes at 220° F.

On the 17th he stated that he was 'decidedly better,' and he was discharged after further treatment on several occasions; he expressed himself as having been distinctly benefited by the treatment.

ACUTE GOUT.

CASE I.

A. R.; aged 60. Cotton spinner. Suffering from acute gout in both feet, toes and ankles, both knees, and index finger of right hand. All these joints are swollen, tense with effusion, exquisitely painful and immovable. The present attack has lasted about a fortnight, during which time he has had little or no sleep on account of the pain.

History.—Thirteen years ago suffered from shock, the result of a railway accident, and four days afterwards had his first attack of gout. Began with pains in the head, followed in a few days with pain and swelling in the ball of the great toe of the right foot. From this time till present date has had periodic attacks once or twice a year.

November 21.—In spite of treatment, the pain was so severe that I asked Mr. Tallerman, who very kindly consented to treat the patient in the Tallerman-Sheffield Superheated Dry-Air Bath with the following remarkable result:

Before the operation the patient lay helpless upon his back, having a drawn and anxious expression, absolutely unable to move, except his left arm, and his right arm only from the shoulder. Temperature 100·6°, and pulse 92° full.

The left leg was put into the cylinder, and the temperature raised from 150° to 220°, whilst the rest of the body was enveloped in a blanket. In ten minutes he was asked, 'Have you any pain?' when he thought for a moment, and said, 'No; the heat seems to have absorbed the whole of the pain.' After thirty minutes he was able, slowly and without pain, to move the fingers of his right hand so as to make a loose fist. At the end of forty minutes he was taken out of the cylinder. During the operation he perspired profusely, and his pulse had risen to 108°, whilst the

temperature was up to 101.6° . Twenty minutes later temperature had fallen to 100° and pulse 92° . He was able to move both his ankles slowly, and had some degree of flexion in both knees, which, however, were still very tense. In about two hours the pain returned, and was very severe for about twenty minutes, when it disappeared, and he slept eight hours with one break of about ten minutes.

A second bath was given the following day, when it was noted that the temperature rose from 100° to 100.6° , and the pulse from 96° to 104° . This bath was given for forty-five minutes, during which the temperature was raised from 160° to 220° .

November 26.—Patient convalescent; has had no return of the pain; able to be up in his room for six or seven hours.

December 10.—Right knee painful and stiff, temperature 99.6° and pulse 88° .

December 14.—All pain gone. Patient downstairs. Pulse 80° , temperature 98.2° ; able to walk up and down stairs without inconvenience, though slowly.

Only two baths could be given, as Mr. Tallerman had to return to town and could not leave the cylinder, otherwise I feel sure the convalescence would have been much shortened.

JOS. G. G. CORKHILL, M.B., etc.

CASE II.

Treated at the North-west London Hospital. Under the care of MR. MAYO COLLIER, F.R.C.S.

W. E. E.; aged 57 years. Goods guard, L. and N.W.R. Patient sprained his right ankle whilst at work on August 11, by striking it against a stack of iron.

On the day after the injury he had a typical attack of gout in the great toe of the injured foot, and stated that he had been unable to sleep for two nights, and was in great pain.

On Examination.—The right ankle and foot were very much swollen, the joint filled with fluid, and the entire surface reddened and shiny. Acute tenderness was present over the whole foot, especially over the tarso-metatarsal joint of the great toe; all movements were painful, and the foot could not be put to the ground.

First Operation, August 14. Forty minutes.

After the bath, the pain and tenderness to pressure and movement had gone from the ankle-joint, and the pain and tenderness in the great toe were much modified.

Second Operation, August 15. Thirty minutes.

Patient had passed a good night, and after the operation he was able to stand.

Third Operation, August 20. Thirty minutes.

On Examination.—There was no pain or tenderness on movement or pressure, and the patient was now able to walk. Some redness still remained.

Fourth Operation, August 21. Forty minutes.

Swelling almost gone; no pain or tenderness.

Fifth Operation, August 23. Forty-five minutes.

The patient having reported that he had been able to walk for twenty minutes without pain, and all effusion having disappeared, the ankle and great toe being now freely movable and without pain, he was considered in a fit state to resume his ordinary duties, and was discharged.

Note.—The temperature in this case was maintained at from 230° to 240° F., and the result obtained was most satisfactory. The pain was relieved almost at once, the effusion rapidly disappeared, and the patient was cured of a bad attack of gout with a severe sprain in twelve days.

J. F. SARGEANT, M.R.C.S., L.R.C.P.

CASE III.

L. N., a gentleman, aged 53, who for some years past has been subject to occasional attacks of gout, had in April last a sharp seizure in one ankle. After the first bath of one hour the pain was gone, and he was able to put his foot to the ground. The treatment was repeated on the two following days, and he then returned to business.

B. MEREDITH ROWE, M.R.C.S.

Up to this date there has been no return, or other attack.

CASE IV.

Under the care of ARTHUR ROBERTS, M.D., *Harrogate.*

A. H., aged 51 years, was suffering from acute gout in both knees and feet, and left arm.

Had suffered for twenty years from gout, but up to now had always been able to walk about on crutches. Had been treated by medical men at various places, but received no permanent benefit, nor had he ever at any time been entirely free from the stiffness in the joints, though he had often been better and worse.

Now he is completely laid up, and for several nights has not been able to sleep owing to great pain.

I considered the case a suitable one for treatment by the Tallerman-Sheffield Patent Localized Hot-Air Bath mentioned by Mr. Willett in his clinical lecture at St. Bartholomew's; and a cylinder was obtained from London.

June 4, 1895, the patient was treated for the first time.

Before treatment: Temp. 99° , P. 80° , R. 20° .

The left leg was put in the cylinder. Twenty-five minutes later he could straighten the leg and bear pressure on the knee without any pain. After the operation all the pain was gone, both in left leg and also in the other leg and arm.

Operation, 45 minutes. Temp. after bath 99° , P. 84° , R. 20° .

Measurement of radial artery by arteriometer:

Before, 1.8 mm.

During, 1.9 mm.

After, 2.4 mm.

All these observations were taken in the recumbent position.

Patient said he 'felt very much better, and the bath was worth all the expense and trouble.'

Second treatment, June 5, 1895. Left leg in 45 minutes. Patient finds all his pain gone. The pain had not returned since last treated.

Arteriometer:

After 20 minutes, 1.9 mm.

After bath, 2.5 mm.

Third treatment, June 6, 1895. Pain has not returned. Right leg was placed in the cylinder.

Arteriometer :

Before	{	Right, 2·8 mm.
		Left, 3·5 mm.
After	{	Right, 3·5 mm.
		Left, 4·0 mm.

This showed that the effect of the bath was to increase the calibre of the radial artery, and the improvement was not only in the leg, but also in the general system.

Fourth treatment, June 8. The left arm was placed in. I was not present on this occasion.

Arteriometer before bath :

Right radial, 2·5 mm.

I saw patient after the bath, and he reports continued improvement. Patient says that he has 'never had any treatment that has produced such a profound and beneficial effect on his system before.' He is delighted with it.

The duration of the operations averaged about forty-five minutes, and the temperature 240° F.

Case still under treatment (June 8, 1885).

ARTHUR ROBERTS, M.D.

STIFF AND PAINFUL JOINTS.

CASE I.

Treated at St. Bartholomew's Hospital. Under the care of
MR. W. J. WALSHAM, F.R.C.S.

T. W. Builder. Potts' fracture one year ago. Joint painful, and bones in bad position.

Osteotomy of tibia and fibula, with removal of wedge-shaped piece of tibia.

Position much improved; pain on walking still.

This patient complained greatly of the pain on moving ankle-joint.

He was treated by the Tallerman-Sheffield hot-air method; altogether he had six or seven baths. The movement in the ankle remained unaltered, but he expressed himself as much better as regards the pain. This improvement, he has since informed me, has continued.

MARTIN JONES, M.R.C.S., House-Surgeon.

CASE II.

*Treated at St. Bartholomew's Hospital. Under the care of
MR. W. J. WALSHAM, F.R.C.S.*

J. J.; aged 35. Fractured leg. Treated plaster of Paris.

Condition.—Joint stiff (ankle); painful on forced movement. He was treated twice or three times by the hot-air bath. He was much improved; movement gave him much less pain, and he walked with much greater comfort.

MARTIN JONES, M.R.C.S.

CASE III.

*Treated at the Royal Portsmouth Hospital. Under the
care of MR. D. WARD COUSINS, F.R.C.S.*

S. C.; aged 50. Fell downstairs six weeks ago, and sustained severe sprain of wrist; wore a splint for six weeks, and then consulted a doctor, who advised her to undergo treatment in hot-air cylinder. Came to hospital on October 8.

On Examination.—The wrist and fingers were found to be extended perfectly stiff, and attempts at passive motion caused great pain. Patient herself could not move any of the fingers, but could touch base of index-finger with the thumb. She was reluctant at having the adhesions first broken down under an anæsthetic, so that it was determined to try the effects of the air cylinder without.

First Operation. October 9.

Hand and arm placed in cylinder for forty minutes at temperature of 240° F. After fifteen or twenty minutes she said she could move her forefinger slightly. On withdrawing the hand from the cylinder it was found that the fingers could be moved slightly without much pain, and she could herself touch the tip of her index-finger with her thumb. Although before the treatment she complained of great pain on attempting to flex the wrist, after the bath it was partially flexed, and several adhesions broke with an audible snap, the patient experiencing but little pain.

Second Operation, October 11. Forty minutes at 290° F.

Movement in fingers and wrist still greatly increased. Patient could touch the tips of all her fingers with her thumb. Some more adhesions in wrist were broken without much pain.

Third Operation, October 13. Thirty minutes; 280° F.

Movement in fingers and wrist markedly increased. She can now flex all her fingers into the palm, and has a good range of motion in wrist-joint.

Saw patient again on October 28. She can now make a fist, and move her wrist-joint freely. Is greatly pleased at the result of the treatment, and has resumed her household duties. Pain on movement is but trifling.

T. H. BISHOP, M.B., C.M., House-Surgeon.

H. W. MORLEY, M.R.C.S., L.R.C.P.

CASE IV.

Treated at the Royal Portsmouth Hospital. Under the care of MR. D. WARD COUSINS, F.R.C.S.

H. W.; aged 12. Stiff fingers after a fracture of forearm three months ago.

First Operation, October 3. Forty minutes; 265° F.

Considerable improvement; fingers much less stiff.

Second Operation, October 4. Thirty minutes; 240° F.

The stiffness of the fingers has greatly improved; can fully flex the fist, and fully extend all the fingers with the exception of the little and ring, which cannot be quite straightened.

Third Operation, October 9. Thirty-five minutes; 230° F.

All the fingers can be fully flexed and extended without pain. When last seen (November 2) his hand was perfectly well.

T. H. BISHOP, M.B., C.M., House-Surgeon.

H. W. MORLEY, M.R.C.S., L.R.C.P.

CASE V.

Treated at the Royal Portsmouth Hospital. Under the care of MR. D. WARD COUSINS, F.R.C.S.

E. B.; aged 31. Stiff fingers after collis fracture nine weeks ago. All fingers are semi-flexed. Unable to straighten them herself, and attempts to forcibly extend them cause severe pain.

First Operation, October 4. Forty minutes; 250° F.

After the bath the fingers could be further extended with less pain; straight splint applied.

Operation repeated on October 9, 11, and 16; on each occasion for thirty minutes, at temperature of from 240° to 265° F. At the end of the treatment she could freely extend the fingers without pain, and she has now resumed her occupation, and is quite well.

T. H. BISHOP, M.B., C.M., House-Surgeon.

H. W. MORLEY, M.R.C.S., L.R.C.P.

CASE VI.

*Treated at Charing Cross Hospital. Under the care of
MR. MORGAN, F.R.C.S.*

W. D. Injury to hand. Under treatment twelve weeks. When the wound was healed there remained stiffness at wrist-joint, and also metacarpo-phalangeal and inter-phalangeal joints. Massage for some six or eight weeks improved matters to a degree, but it was thought advisable to adopt the hot-air bath treatment by the Tallerman-Sheffield process. This was done for three weeks, with a marked improvement as result.

C. LOCKYER, M.R.C.S., L.R.C.P., House-Surgeon.

CASE VII.

*Treated at the North-west London Hospital. Under the
care of MR. MAYO COLLIER, F.R.C.S.*

L. B.; aged 12. Tubercular knee-joint. Had been kept at absolute rest in plaster of Paris for upwards of seven months. On removing the splint the disease was found to have disappeared, leaving little or no movement, any attempt to increase it causing severe pain.

After six operations the movement had increased 45° to 50°; there was no grating in the joint, and the patient could walk freely and well; no forcible movement was used.

CHRONIC RHEUMATISM.

CASE I.

*Treated at the Royal Portsmouth Hospital. Under the
care of MR. D. WARD COUSINS, F.R.C.S.*

I. C.; aged 24. Carpenter. Invalided from Royal Engineers for chronic rheumatism. Has been unable to work for some months on account of pain in right wrist. Considerable thickening round wrist-joint. Range of

motion limited and grasp very feeble. Attempts to move joint caused considerable pain.

First Operation, October 18. Forty minutes; 240° F.

Hand and arm placed in cylinder. After twenty minutes, patient stated that he was quite free from pain.

Second Operation, October 28.

Patient states that since the last operation he has suffered much less pain. The grasp is stronger. Range of motion increased, and the pain accompanying it is less. Placed hand in cylinder for forty minutes at 240° F. Thickening round joint decreasing.

Third Operation, October 23.

The thickening round the joint has much decreased. Can now grasp firmly with the hand, and is almost free from pain. Hand placed in cylinder for thirty minutes at 260° F.

Fourth Operation, October 25. Forty minutes; 260° F.

Thickening almost gone. Pain very slight. Patient was, unfortunately, not able to attend any more. The improvement, however, was most marked, the thickening being all absorbed, the range of movement and strength of grasp being considerably increased, and when seen on November 2 he could flex and extend the wrist-joint almost to the full extent without any pain, whereas before the treatment the movement was limited in extent and accompanied with severe pain.

T. H. BISHOP, M.B., C.M., House-Surgeon.

H. W. MORLEY, M.R.C.S., L.R.C.P., Assist. H.-S.

CASE II.

Treated at Charing Cross Hospital. Under the care of MR. J. H. MORGAN, F.R.C.S., Sen. Surgeon to the Hospital.

H. J. M.; aged 23. Postman. Second attack of gonorrhœal rheumatism in knees, ankles, and wrists. After various treatments had been tried, the bath was used for the right knee and left wrist. This treatment was commenced on February 6, and was continued daily, the knee being treated until the 14th, when the wrist also was treated. Patient left hospital on March 16, and his cure was apparently much accelerated by the bath.

CHARLES GIBB, Surgical Registrar.

CASE III.

*Treated at Charing Cross Hospital. Under the care of
MR. WATERHOUSE, F.R.C.S.*

A. B.; aged 24. Gonorrhœal wrist. Terminating in rapid cure.

CHARLES GIBB.

CASE IV.

Demonstrated at the Annual Homœopathic Congress.

P. B.; aged 43. Painter. He came up to the meeting of the Annual Homœopathic Congress on June 28, 1894, when he was found to have the metacarpal and phalangeal joints of both hands so stiff that he could not close either hand. The wrist-joints of both hands were also stiff, and admitted of very little movement. These joints pained him considerably, especially on movement. The knee-joints were also stiff to a certain extent and painful. His state was seen and examined by all the members of congress present. He had been under treatment at the Royal Free Hospital off and on for two and a half years since his attack of acute rheumatism. The right wrist and hand being the worst, this arm was placed in the hot-air cylinder, and kept there for an hour, the temperature rising to 260°. After being released from the cylinder, this man could close his right hand without pain, and the movements of the wrist were considerably improved. Curiously enough, the left hand (which had *not* been in the cylinder) was also much improved, and he could close it also without pain.

The knee-joints also, he said, were free of pain. This result is certainly remarkable and interesting, showing that the beneficial effect on the limb which had been exposed to the hot air was participated in by the other joints.

DYCE BROWN, M.D.

For other cases treated at St. Bartholomew's Hospital, under the care of Mr. ALFRED WILLETT, F.R.C.S., see Mr. Willett's Clinical Lecture (p. 39).

SPRAIN.

CASE I.

*Treated at the North-west London Hospital. Under the
care of Mr. MAYO COLLIER, F.R.C.S.*

W. H.; aged 11. Sprain of right ankle. Right ankle and foot swollen, tender, and painful, with great pain on move-

ment and inability to put the injured foot to the ground. There was a good deal of effusion, both into the tendon-sheaths and into the joint itself.

First Operation, August 13. Forty minutes.

On examination after treatment, the pain was found to have almost disappeared; there was considerably less effusion, and the foot could be put to the ground.

Second Operation, August 14. Thirty-four minutes.

Further improvement, with power to flex and extend the foot.

Third and last Operation, August 16. Thirty minutes.

The effusion entirely absorbed; patient walked well and without pain, and was discharged as cured.

Note.—The result of the treatment in this case was very satisfactory, a severe sprain having been cured after three operations in four days.

J. F. SARGEANT, M.R.C.S., L.R.C.P.

CASES II. AND III.

Treated at the North-west London Hospital. Under the care of MR. MAYO COLLIER, F.R.C.S.

T. Y., aged 22, butcher; W. J., aged 24, groom. Both these cases were sprained ankles, with the usual severe symptoms. Each was treated on five occasions with most satisfactory results. The pain in both cases had disappeared after the second operation, and the joints were quite sound after the fifth.

CHRONIC TRAUMATIC SYNOVITIS.

Treated at the Royal Portsmouth Hospital. Under the care of MR. D. WARD COUSINS, F.R.C.S.

J. L.; aged 49. Labourer. Chronic synovitis of knee-joint over two years. History of injury, by fall. Before dry heated air treatment was commenced, other methods had been resorted to for several months without producing any satisfactory results. Knee considerably swollen; kept always in a position of considerable flexion; gave pain on movement; and also when at rest very limited range of

movement. Disease had made considerable progress and affected the bones, in addition to the synovial membrane of the knee-joint. The treatment was continued for the whole of the month during which the apparatus was available, and in all the hot-air bath was applied nineteen times. On cessation of treatment the circumference of the limb, measured above the patella, over it and below it, had diminished by half an inch at each point. Range of movement also slightly increased. Pain undoubtedly considerably relieved.

T. H. BISHOP, M.B., C.M., House-Surgeon.

H. W. MORLEY, M.R.C.S., L.R.C.P., Assist. H.-S.

CHRONIC ULCER.

Treated at North-west London Hospital. Under the care of
MR. MAYO COLLIER, F.R.C.S.

E. W.; aged 45. Staymaker. Suffered from chronic ulcer of right leg for five years. Treated at North-west London Hospital as out-patient without improvement, and was in-patient at the Temperance Hospital for six weeks, at the end of which time the ulcer was healed. Two years ago it broke out again after a fall, and has since been getting worse.

On examination, a large unhealthy ulcer about the size of the palm of the hand was found in front of right leg just above ankle; edges unhealthy, base covered with thin white slough. Loss of tissue about $\frac{3}{16}$ inch in depth.

Treated twice in hot-air bath, each operation averaging 35 minutes. The base was then found to be much cleaner, and the margins showed signs of healing. About fourteen days later patient seen by Mr. Mayo Collier, who found that the lost tissue was replaced, the ulcer had filled up, the margins showing further unmistakable signs of healing.

J. F. SARGEANT, M.R.C.S., L.R.C.P.

FLAT-FOOT.

No case notes are as yet available, but the following paragraph occurs in the recently-issued work on 'The Deformities of the Human Foot, with their Treatment,' by W. J. Walsham, M.B., F.R.C.S., Senior Assistant-Surgeon,

Orthopedic Surgeon, and Lecturer in Anatomy at St. Bartholomew's Hospital, etc.:

'Treatment of the Third or Rigid Degree of Flat-Foot by the Hot-Air Bath.—Since writing the treatment of flat-foot, we have, instead of giving an anæsthetic, placed the rigid foot in the Tallerman-Sheffield Hot-Air Bath, in order to produce relaxation of the adaptively-contracted muscles and ligaments. In several cases in which the foot was held rigidly abducted with the bones displaced in the way characteristic of the severe degrees, and in which, moreover, the bones could not be forced back by manipulation with the unaided hands, we found that, after the foot had been three-quarters of an hour in the bath at a temperature of about 300° F., it came out quite supple, so that without any force the bones could be replaced and the arch restored. The foot was then in some instances put in plaster of Paris in the adducted and plantar-flexed position for the usual time, and in other instances a boot or boot-iron was ordered and exercises begun.'

In commenting on some of the foregoing cases, *The Lancet* observed (January 12, 1895):

'It must be confessed that the results obtained by the usual treatment in cases of chronic stiffness of joints are far from satisfactory, so that one is inclined to welcome all the more cordially a recent therapeutic method which claims, and apparently with justice, to remove, at least in part, this reproach from surgery. The Tallerman-Sheffield Local Dry Hot-Air Bath is an invention by which dry air at temperatures from 250° to 300° F. is applied to a portion of the body, such as hand or foot, knee or elbow, an arm or leg. In May of last year Mr. Alfred Willett delivered a clinical lecture at St. Bartholomew's Hospital on some cases which he had treated by this method; and the present list consists of a series of eight cases in which this bath was employed at the North-west London Hospital, under the care of Mr. Mayo Collier. The bath itself

consists of a copper cylinder, varying in size and shape according to the part to be enclosed. At one end the limb enters, surrounded by rubber sheeting, and the other is closed by a movable cap working on a pivot, by the use of which, and outlets at the top and bottom of the cylinder, it is found possible to keep the air in the chamber practically dry throughout the operation, notwithstanding the moisture thrown off by the limb enclosed, and instant relief can be afforded the patient if the temperature causes any discomfort. The cylinder is heated by gas-burners placed underneath. Precautions are taken to prevent the skin from coming into contact with the heated metal. Mr. Willett's conclusions are decidedly in favour of the treatment in certain cases, and his results may be summarized as follows: The first effect of the heat is to induce a copious diaphoresis; and the circulation of the blood in the part is enormously increased, as is well shown by the bright redness of the limb when removed from the bath. The anodyne effect is often remarkable; pain is generally not only relieved, but entirely removed, so that the patient expresses the great relief he feels, and moves the limb with much greater freedom and with much less pain. The cases that appear the most likely to be relieved by the treatment are sprains, stiff joints (where there are no very strong adhesions), flat-foot, gonorrhœal rheumatism, acute and chronic gout, chronic ulcers, and rheumatism. It deserves also to be employed for its anodyne effect after forcibly breaking down under an anæsthetic adhesions which have formed in or around a joint; if the limb be placed in the cylinder, the pain, which is generally severe, is greatly lessened and the secondary stiffness is much diminished. Mr. Willett was of opinion that but little assistance would be afforded by this bath in overcoming firm, fibrous, articular adhesions. Sooner or later the adhesions will have to be forcibly broken down under an anæsthetic, but, such having been done, I think the recovery will in many cases be hastened by the subsequent use of the heated cylinder. In other words, while facility

in active movements is immensely increased, the range of movement is not extended to any great amount. The results obtained in the cases treated at the North-west London Hospital endorse the favourable opinion of Mr. Willett, and the benefit to be derived in rheumatic arthritis is shown in two cases, and in gout in one. The general effect of the bath is marked, but apparently in no way injurious. The entire skin is relaxed and perspires freely, and pain is relieved in joints other than those enclosed in the cylinder.'

The *Clinical Journal* of July 31, 1895, contains the following paragraph:

'THE TALLERMAN-SHEFFIELD PATENT DRY BATH.—The amount of benefit which has been derived from this treatment since it was first introduced to the reading medical public in a lecture delivered at St. Bartholomew's Hospital, by Mr. Alfred Willett, on May 23, 1894, has certainly been surprising; but not, perhaps, so surprising as the fact that it has not become even more widely known. The apparatus consists of a metal cylinder, asbestos-lined. This cylinder is heated to a temperature of 150° F., when the affected joint is placed in it, and practically sealed up. The temperature is then raised to a high degree (even 300° F. has been borne), the patient being enabled to endure the great heat with perfect comfort, owing to the system of heating and ventilation used admitting of the perfect dryness of the air in the cylinder. The utility of this treatment for stiff joints, or for use after adhesions have been broken down, is enormous, the pain being greatly modified, if not entirely dispelled. These dry baths can be seen at No. 50, Welbeck Street, W., where patients can be received for treatment.'

A CLINICAL LECTURE

On the Therapeutic Action and Uses of the Localized Application of Dry Air heated to High Temperature in Certain Classes of Surgical Affections.

Delivered at St. Bartholomew's Hospital on Wednesday, May 23, 1894, by

ALFRED WILLETT, F.R.C.S.,

Surgeon to the Hospital.



GENTLEMEN,—My lecture to-day is on ‘The Therapeutic Action and Uses of the Localized Application of Dry Air heated to High Temperatures in certain Classes of Surgical Affections.’

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It was only in January that I first heard of this invention, and I was startled at what I heard it could do. My information, it is true, was not at first hand, and probably, as usual, the story lost nothing in being repeated. But this is what a medical friend told me.

He said a complete revolution, he had heard, had been made in the treatment of all sorts of contractions and of ankylosed joints. By the action of air heated to 250° or 300° F., any such affection, even a congenital club-foot—and that was particularized—would, in the course of an hour or so, become so relaxed and pliant, that the surgeon could at once quite painlessly move it in any direction, and effect an immediate cure of the deformity by restoring the foot to its correct position.

Such is the story that was told me. I readily accepted an invitation to witness those vaunted powers put to the test; and, accordingly, on January 23, at the courteous

invitation of Mr. Tallerman, one of the inventors, I went to 1, Chiswell Street with Mr. Walsham and Mr. Paterson, my house-surgeon. There were some three or four other medical men present. Of the few patients collected two were selected for trial. The first was a middle-aged man with sub-acute synovitis of the knee. Increased heat, slight effusion, and some pain existed. This was increased on attempting to move the knee, which was held semi-flexed, having a range of active movement of only 10-15°. He could only walk, or rather, I should say, hobble, with the aid of two sticks, on the toes of the affected limb. In this condition he was placed in a cylinder like the one we have here. When taken out of the bath, after some thirty or forty minutes, the knee was straight, all pain had left him, the foot was on the ground, and he walked almost briskly out of the office. I heard that in a few days' time he returned to work. This result naturally made a considerable impression on me, for I know of no treatment that could have brought about so rapid a cure. The case, no doubt, was not only curable, but well on the road to recovery. At the time I said that in hospital I should have anæsthetized the patient, manipulated his knee, and then brought it straight; but even so I feel sure that many days would have elapsed before he would have been well, whilst here the man had been apparently almost cured in little more than half an hour, not only quite painlessly, but by a process that one might almost call that of luxurious ease.

The second case was equally satisfactory—that of a woman of about 45, with both hands crippled by chronic gout. The fingers were all kept slightly flexed. Before going into the bath she could neither straighten nor flex them. It appeared that slowly, for upwards of a year, she had been drifting into this condition, and now she could do but little for herself. Only one hand, the right—said to be the worse—was put into the bath. After fifteen minutes she volunteered the statement that her fingers seemed to loosen, and soon after she could oppose the thumb to all

the fingers, which for many months she had not been able to do. After half an hour the hand was removed from the bath. I saw her open and close her hand readily, while the left, which had not been treated, remained in the same fixed position. Of the subsequent state of this patient I have heard nothing. Both these patients were entirely comfortable all through the process. If they felt the bath too hot, air was readily, for a second or two, admitted, and then a higher temperature could always be borne. The patients perspired freely, and when the limbs were taken out of the bath they were very red and moist.

Subsequently, I was asked if I would test the efficacy of the bath at this hospital, and having obtained the consent of the authorities, I have done so, and desire now to put the results before you.

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I will now read you the abstract of the notes of cases which were treated in President and Pitcairn Wards, and comment on them in turn as occasion requires; for time does not permit, neither is it necessary, that I should weary you with the full notes.

Alice C., 25 years of age, was admitted into President Ward on September 29. Her history was one of gradual onset of pains seven years previously, a dull aching by day and night. Six years ago, or one year after the onset of these pains, she had rheumatic fever. She was under treatment at Reading, and subsequently at Bath. On admission, her condition was that of an anæmic girl, with very pained expression; heart's sounds natural. She was almost helpless and bedridden from crippled joints. The affected joints were the right ankle, knee and hip, the left hip and both elbow and wrist joints; all these were stiff and painful. The right hip and knee were flexed at angles respectively of 165° and 90° ; both elbows were flexed to about 120° , with about 35° angle of movement. The wrists were completely ankylosed. The changes chiefly affected the fibrous structures of the joints, but about the elbows, especially the left, were bony and cartilaginous defects,

with creaking and grating on movement in both. The electrical reactions were normal.

On January 17 the right hip, knee, ankle and right elbow and wrist joints, were all forcibly broken down and moved under an anæsthetic. The right hip and knee were brought straight and fixed upon a Thomas's hip-joint splint. On the 25th, under passive movement there was some improvement. Nitrous oxide gas was again administered for wrenching the right wrist and elbow. At this time the left elbow was the worse, but I thought it better to confine myself to the joints on the right side of the patient's body. She was still being treated by passive movement and given cod-liver oil. On February 20, Tallerman's hot-air bath was used at a temperature of 260° for fifty minutes. There was much less pain afterwards; the range of motion was not increased; the movements, however, were more free through the given range. But on any stretching of the joints, with the view to obtaining increased range of movement, the old pain was felt. The baths were continued from February 20 to March 21. Up to this time there was no very definite improvement beyond the above changes. On April 9 gas was administered, and the left elbow extended and flexed, all the adhesions in it being broken down, and afterwards placed in the bath. On the 19th it was noticed there was general improvement in all her joints. The left elbow, which was the worse, was much less painful and more mobile.

I now show you the patient, who, as I mentioned, was admitted practically bedridden and helpless just at the end of last year. She left the hospital walking on crutches. Any movement was attended with great pain when she came here; on leaving, the joint movements were much freer, almost painless, and the patient was able to do almost everything for herself. These noticeable changes, relief from pain and freer movement, were mainly attributable, I think, to the influence of the hot-air baths. She was under the bath treatment for about eight weeks. On asking her to strike at my hand, we find that the right

upper extremity is the stronger, but with both she can hit my hand a fairly vigorous blow; on admission it would have been absolutely impossible for her to have attempted anything of the kind. I mentioned the great creaking which occurred in the joints; now within the range of movement the joint has become quite natural. The range of movement in her left elbow-joint is better than it is in the right; the flexion is a little greater, the extension perhaps not quite so good, but here again the movement, although not absolutely smooth, or so smooth as in the right, is accompanied by less marked creaking than when admitted. The wrist-joints were absolutely fixed. She has a moderate amount of pronation and supination; still, if I put any strain upon the joints, it is obvious that it pains her. Her right wrist remains very stiff.

The next case was that of a man named James L., 26 years of age, a plumber, suffering from urethral synovitis. One month he has had discharge, for two weeks and a half pain in the left knee, afterwards in the right ankle and both feet. On admission his left knee, right ankle and both feet were swollen, tender and hot, but there was no marked redness. There was no cardiac murmur and no sweating. The temperature was raised 2° to 3° . Past history: Rheumatic fever twenty years ago. During the first two weeks after admission he had much pain in the knees, ankles and feet continuously, but varying in intensity. His joints were all stiff. His temperature was raised usually, frequently to 101° . He was relieved by blisters. The movements of the joints improved.

About February 20 he was placed in the hot-air baths. From that time his improvement commenced. He left the hospital at the end of March. The movements of his joints were greatly improved, and all active inflammatory condition passed away. His knees and ankles and right shoulder were slightly painful, but the movements were nearly natural. This was an extremely severe case of that form of rheumatism, and one which, I think, might have

left him crippled by adhesions, although he would have got well in time; yet no improvement took place until one ankle and knee were placed in the cylinder, and from that time convalescence commenced. I feel convinced the bath treatment greatly accelerated recovery, and probably prevented some serious organic changes in the joints. That patient was five weeks under treatment.*

The next was a man named Benjamin D., 22, a potman, the subject of talipes planus. He had suffered from rheumatic gout three months previously in the ankles. From that time he had pain on standing. For the two months before admission he had less pain but great weakness of the ankles. It was thought that this case would be benefited by treatment in the cylinder; at all events, it was a fairly good case for testing its efficacy. For five weeks he had hot-air baths, but without permanent benefit. The immediate result of the baths was greater mobility in the tarsal joints and less pain, but every time that he came after two days' interval he said he was no better, and it was obvious that he was not improving. He was therefore admitted to the hospital, and submitted to the usual, or one of the usual, forms of treatment—wrenching under an anæsthetic, and placing the limb in plaster of Paris. He subsequently left the hospital with a very good result. Here the bath failed to benefit beyond affording relief to pain and stiffness whilst in the bath. The result perhaps might have been different if this patient had at the time

* The following letter was afterwards received from this patient:

‘111, Rosoman Street, Clerkenwell, E.C.,
‘July 1, 1894.

‘DEAR SIR,—I take the pleasure of writing to let you know that I am the patient mentioned in the *Clinical Journal* by Mr. Willett, in his lecture—J. L.; aged 26; plumber; and since leaving the hospital the pains in my shoulders and knees and ankles have all left me, and I thought right to call at the hospital and let Mr. Willett see me, and I feel now as strong and as well as ever I was; and as Mr. Willett stated, I might have been crippled by adhesions, or probably suffered from serious organic changes in the joints, I offer my sincere thanks for the treatment of the bath, and if anybody wishes, they can see me at any time.—I remain, yours truly,
‘J. LATHAM.’

This patient attended at the Homœopathic Congress, and was examined by the medical men present (see Report of Congress, p. 57).

been an in-patient, but being an out-patient, and having to go away and walk about prejudiced the chances of recovery.* Still, the case was only treated with the baths as a test case.

Cecilia L., aged 17, was admitted into President Ward on January 16 suffering from painful knee, believed to be a subacute tubercular affection. In June, 1893, she had been in President Ward under Mr. Cripps, and the limb was then brought into a good position and put up in plaster of Paris. Some enlarged cervical glands at that time were also removed, and hence there is good reason for believing that the diagnosis of tubercular affection was correct. In the meantime she had been from time to time treated by reapplication of plaster of Paris splints, and once leather splints were moulded to her knee, and worn for a time. Recently there had been an exacerbation of pain and swelling, and for this she was readmitted. She was of the rather dull, sleepy type of patient. There was some backward displacement of the tibia, with a tendency to rotation of the tibia inwards rather than outwards. The patient usually lay, not on the affected side, but upon the opposite side, and rolled her limb inwards. This, of course, kept the crucial ligaments tight, and also prevented backward and outward displacement. On January 17, on account of localized pain, an icebag was applied; and in February a ten-pound weight was adjusted, position remaining good. On February 3 the limb was again put into plaster of Paris. It was taken out on the 9th. On the 20th the hot-air bath, at a temperature of 170° F., was used for half an hour. This did not seem to increase the movement, but did seem to diminish the pain. Ultimately she left the hospital wearing a Thomas's knee-splint. The leg was straight and firm and much less painful, and her general state of health was improved. This patient had the bath on only two or three occasions. Probably the affection was rather too acute, or, if not so, the patient was

* This is confirmed by results obtained by more systematic treatment in the orthopædic department.

of that neurotic type, in whom it is difficult to tell whether the pain is real or imagined. But it did not, on the whole, seem a very fair test case for the bath treatment; she complained so greatly of it that it was soon abandoned. I think she only had some three baths in about two weeks.

The next case in which the bath was used was that of a woman about 45 years of age, who had been one of my in-patients twelve months previously for acute rheumatic inflammation of the wrist-joint. Her attack had been a very severe and prolonged one, and the whole hand and forearm had been throughout kept at rest. Eventually the patient recovered. But she came recently complaining of stiffness in her hand. Flexion and extension, pronation and supination of the wrist-joint were very good. Active mischief in the wrist-joint had entirely passed off, but secondary stiffness of the fingers had resulted. She had the bath treatment for two months very regularly, but I must own that the result of its use in this case greatly disappointed me. I regarded it as the best test case of the series, for her condition was that of a rheumatic joint which had entirely recovered, leaving only stiffness of fingers and hand, resulting from the long-continued immobility. It seemed to me to be exactly the kind of case to be cured. The original affection may, however, I think, have been more diffused and extensive than had been diagnosed, and so perhaps, in addition to synovitis of the wrist-joint, there had been teno-synovitis of the sheaths in front and behind the wrist. But from whatever cause, I cannot doubt that fibrous adhesions within the sheaths had resulted, or that this accounted for the little benefit that was observed after two months of treatment. I have seen that patient within the last fortnight, and I am bound to confess that she seems not in the least degree benefited by the prolonged bath treatment.

The last case that I have just briefly to mention is that of John Edwards, 7 years of age, who had rectangular talipes, the result of infantile paralysis. He was only placed in the cylinder twice; and I may add that my

object in placing him in the cylinder was that, being a case of club-foot, or a form of club-foot, I was anxious that the opportunity of moulding the limb into proper position, if that could be done, should be taken. I saw the boy immediately his foot was taken out of the cylinder, and there was no gain whatever in the extent of movement—that is to say, the rectangular talipes equinus continued quite unaltered; but that the boy had some increased freedom of movement I readily own. But for the object I had in view, namely, to ascertain if the tendo achillis would relax in the bath, the treatment was quite ineffectual. The tendon was subsequently divided, the limb put up in plaster of Paris, and in about six weeks the patient left the hospital with full range of motion in the ankle.

In offering some comments on this invention, I must say at once that I can only express a very guarded opinion at present, mainly because my experience is still very small; yet, small as it is, I have no hesitation in saying it is distinctly encouraging. In the cases that have been treated in President and Pitcairn Wards I was anxious to try the bath in an assortment of diseases, and also to test its action purely and simply. In the next place, the process occupies roughly an hour for each patient, and some of the patients were undergoing the bath treatment for the entire two months. Mr. Tallerman kindly gave his valuable services in supervising its administration; hence, during the two available hours of the afternoon, with two baths going, it was not possible, as a rule, to treat more than about four patients a day, and of these some were under Mr. Walsham's care.

It seems to me that the points for consideration are these:

1. What is the effect of exposing a part, such as a hand or foot, to such temperatures as 250° to 300° F. (a) upon normal parts; (b) upon certain diseased tissues?
2. Is any therapeutic effect produced by such temperatures alone; and, if so, in what classes of diseases? and, again, is the result likely to prove temporary or permanent, partially or completely curative?

3. Are there cases in which air baths of high temperature can be advantageously employed in association with other methods of treatment, for example, where articular adhesions have been broken down?

4. To what depth from the surface is the direct influence of this dry hot-air bath exerted?

5. Is the body generally acted on or affected, either favourably or prejudicially, by the topical use of heated air as in this bath?

I will now, in turn, direct your attention to each of these several points.

As to the first of these questions, I have come to the conclusion that in principle this apparatus for applying dry hot air locally has on the member or limited part of the body so treated an action similar to that of the ordinary Turkish bath on the whole body, that is to say, it induces sweating—diaphoresis. I speak now only of the principle involved in the action of this heated cylinder, and not of the degree, nor of other differences, such as that in the cylinder treatment ordinary air is inspired, while in the Turkish bath the air breathed is greatly heated. In a Turkish bath the temperature in the first room—called the tepidarium—is from 113° to 117° F.; in the second, or calidarium, it is from 132° to 140° F. Although there are recorded instances of the higher temperatures being respired, still, probably the temperature attained in this cylinder—from 250° to 300° F.—is much too great to render its inspiration anything but hazardous—at all events, for such average individuals as frequent Turkish baths. But just by so much as the temperature of the cylinder is greater than that of the Turkish bath, by so much will its sudorific effects be increased. In the next place we note that the part, foot or hand, issues from the bath very much the colour of a boiled lobster; the flow of blood in the skin is obviously, and that in the subcutaneous tissues probably, increased greatly. The third effect noted is what we may term its anodyne influence. In most cases, not merely is pain relieved, but often it will be entirely removed. This

is shown in many ways. The patients invariably express relief. Then they will use the limbs with much greater freedom. Movements that excited pain before can be performed after the limb is placed in the bath without pain. Again, in cases of breaking down of adhesions under gas the patient is in great pain afterwards; but let the limb be placed in the heated cylinder and the pain is greatly lessened, as also is the secondary stiffness, due to extravasation and inflammation round the torn tissues. On the other hand, there is none of the excitement, amounting in some individuals to distress, from breathing the hot air of the Turkish bath before free perspiration breaks out. The patient with arm or leg in this cylinder seems throughout in the most absolute comfort, only now and again complaining of the heat being almost too great—a complaint which is instantly removed by manipulating the apparatus.

If such are the results observed from the baths in healthy persons, its therapeutic influence in certain affections is obvious, and, I think, clear to demonstration. The next consideration, therefore, is, To what class of disease is this plan of treatment likely to be serviceable? I can only speak of its use in surgical affections. Of these, sprains, stiff joints—those where movement is more or less limited—callous limbs, flat-foot, gonorrhœal rheumatism, and possibly some skin affections, are the most likely to be benefited. The cases I have recorded show a fair selection of these.

On the third point, as to its being an adjunct to surgical treatment, I have only to repeat what I have already said, as to the great assistance this hot bath affords after breaking down articular adhesions, both in relieving pain and lessening the tendency to recurring stiffening. I think that, in addition to these, the bath may be occasionally useful as an adjunct to the electrical treatment of certain paralytic cases, and generally useful, I think, before massage to wasted muscles.

As to the extent of action, the cases recorded seem to show conclusively that the direct influence of air heated to

this high degree does not extend much, if at all, beyond the skin primarily. That secondary effects are shown, I readily admit, such as relaxation of muscles which have been irritated or excited to tonic contraction; but for overcoming firm fibrous articular adhesions I am sure this hot-air bath gives the surgeon no direct help, or, putting it in other words, whilst increased power in active movement is nearly always gained, there is no immediate marked increase in the range or extent of motion.

On the last point mentioned, I think there is evidence that the effect of the bath is not confined solely to the part acted on, for the temperature of the patient is raised usually nearly one degree;* true, this elevation of temperature alone would not prove anything, for excitement will often send up temperatures; but the entire skin becomes relaxed, and perspiration occurs freely over the body. Besides, patients unite in saying that with subsidence of pain in the part treated pain is lulled in other joints. I hope some physician will be induced to try the hot-air system in selected medical cases. By analogy I think that in rheumatic arthritis, gouty attacks in arms or legs, sciatica, lumbago, and perhaps in some spinal cases, good results might be anticipated.

In conclusion, I would summarize my remarks by saying that when employed for contractions in recent affections or subacute inflammatory diseases, such, for example, as may follow upon simple synovitis, cases, that is, which would yield readily, and without force, under an anæsthetic, I feel confident that the therapeutic action of this dry hot-air bath to the part will be both marked and rapidly curative. In permanent contractions or fibrous ankyloses the result of old-standing arthritic diseases, the direct therapeutic action is soon exhausted. It will be well that the cause and extent of the disease, so far as actual pathological, *i.e.*, gross alterations of structure, are concerned, should be ascertained at once, because if articular or cap-

* Further experience has led to improvement in the administration of the bath, enabling the body temperature to be now raised 2° and upwards, which explains the remarkable results since obtained.

sular adhesions exist, valuable time would be wasted in attempting to cure such cases in this hot-air cylinder. Sooner or later the adhesions will have to be forcibly broken down under an anæsthetic; but such having been done, I think recovery will in many cases be hastened by the subsequent use of the heated cylinder; whilst in such permanent deformities as congenital club-foot, contracted scars after burns, and bony ankylosis, it is absolutely useless to suppose any effect whatever could result. It would be sheer quackery to advise its use in any such condition.

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In so many surgical cases should this hot-air bath treatment prove serviceable, that I hope it will not be long ere one is available at any time in this hospital, and also that we have a nurse trained to its use.

*From the 'Clinical Journal,' May 31, 1894,
by permission.*

THE END.

