Suspension laryngoscopy and its practical use ; translated by D.R. Paterson.

UNIVERSITY OF LONDON.

The

Semon Lecture, 1914.

SUSPENSION LARYNGOSCOPY AND ITS PRACTICAL USE.

By Professor GUSTAV KILLIAN,
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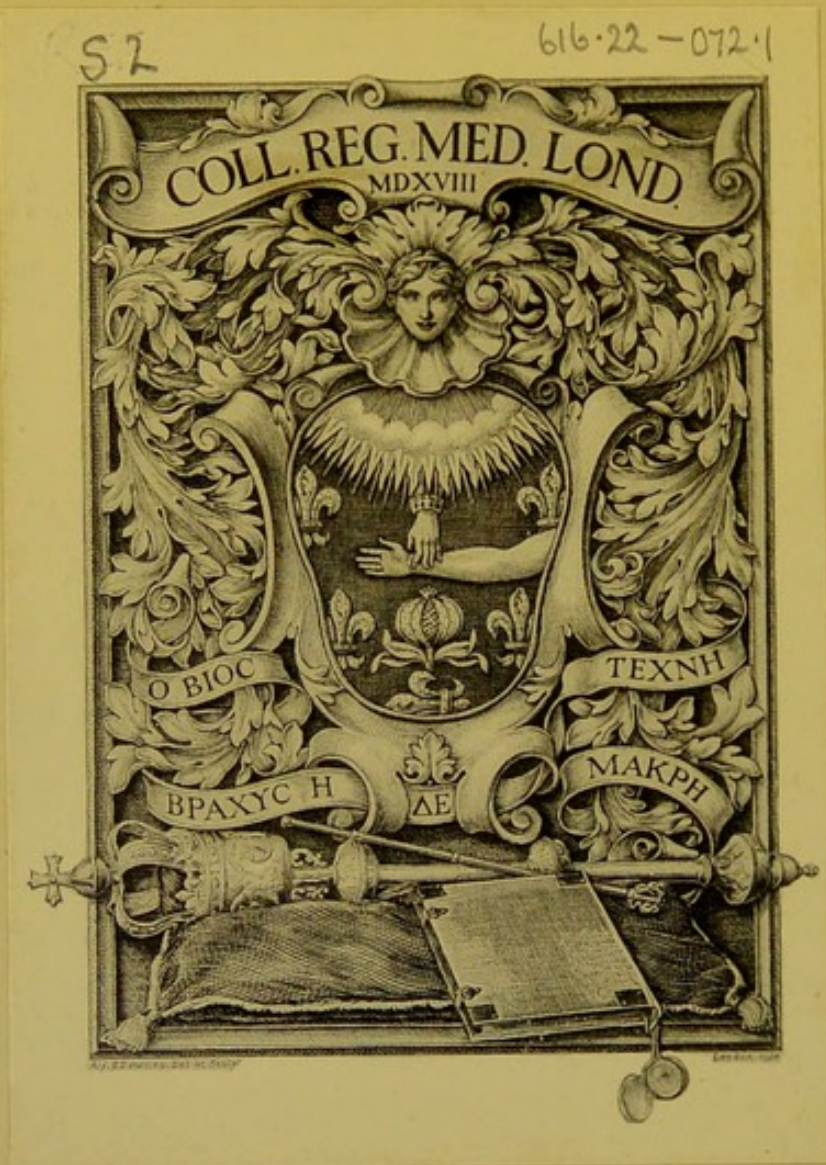

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Oct.12th 1914.

Dear Sir,

I have the honour to present your Library with a bound copy of the last Semon lecture, delivered by Prof. Killian earlier in the year.

Yours faithfully,

G. Watson Williams

THE SEMON LECTURE, 1914.

THE SEMON LECTURE, 1914.

(May 28th, 1914.)

SUSPENSION LARYNGOSCOPY AND ITS PRACTICAL USE.

BY

Professor GUSTAV KILLIAN,

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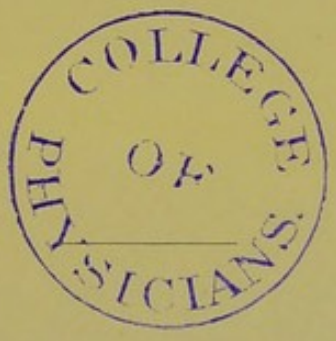

THE UNIVERSITY OF LONDON.

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THE SEMON LECTURE, 1914.

(Delivered on May 28th, 1914.)

SUSPENSION LARYNGOSCOPY AND ITS PRACTICAL USE.

By Professor Gustav Killian,
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I. Historical.

On April 23, 1895, Kirstein, of Berlin, saw the interior of the larynx without a mirror for the first time. On that memorable day our speciality broke altogether new ground. Most of you are already familiar with the way Kirstein, in a very short time, developed direct laryngoscopy. Notwithstanding the zeal and enthusiasm with which he strove to make known and extend the new method, it was a long time before it received general acceptance. And curiously enough it was not vouchsafed to Kirstein himself to realise this. His interests were very soon diverted to the domain of art, and his further activity in the field of our speciality was lost to us.

Personally, Kirstein's communication greatly astonished me, and I freely confess that I had little belief in it. I soon, however, formed a more favourable opinion, especially after reading his first paper in the *Berliner Klinische Wochenschrift*, and seeing his demonstration before the South German Laryngological Society in Heidelberg. From that time my entire thought became bound up in the subject. It occupied me daily, and I practised the direct method in every case where it appeared indicated. That it possessed real value was very soon obvious, materially enlarging as it did our diagnostic and therapeutic knowledge, more especially after I had succeeded

in giving it a form adapted for general use. From that time the tube spatula was used almost exclusively. We penetrated by its aid into the trachea, and ultimately into the bronchi as far as the eye could see. An immense field of scientific and practical activity was thus opened up, to which an unusually extensive literature bears witness.

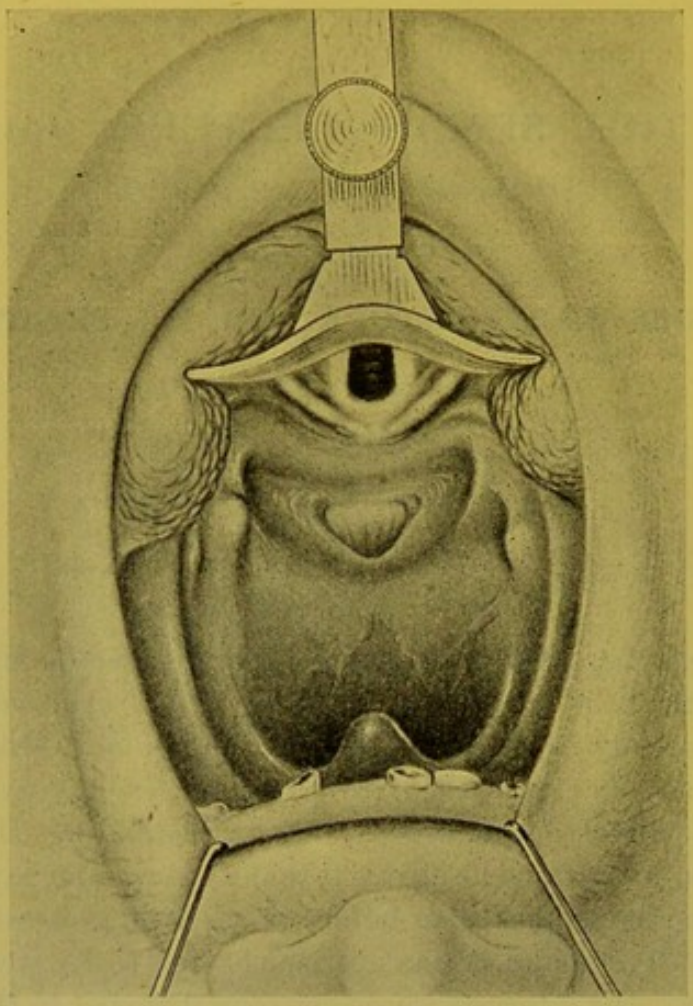

Fig. 1.—View with suspension laryngoscopy in the cadaver. Obtained with the old Kirstein's spatula. The epiglottis is hidden by the spatula. Below the epiglottis the hypopharynx and mouth of the gullet are seen.

It seemed hardly possible that anything more was wanted, and I often asked myself, what further ? I had forgotten the occasions when, during operation, I felt that better access to the larynx than through a narrow tube was much to be desired.

This wish was to be fulfilled. In order to obtain, for a larger treatise, exact pictures of the deeper air-passages I got my artist, in the winter 1909–10, to work from the cadaver, as time is usually too short to sketch and paint from examination in the living. We

made use of the dissecting-room of the Freiburg Anatomical Institute for the purpose. With the head of the subject hanging over the table and the mouth wide open, a spatula was introduced over the tongue and larynx, and the field of view illuminated by an electric hand-lamp. It was too fatiguing to hold the instrument until the artist had finished, so I fastened it to an iron stand, which was screwed on to the dissecting-table. An altogether new situation, viz. the head of the cadaver suspended on the tongue spatula,

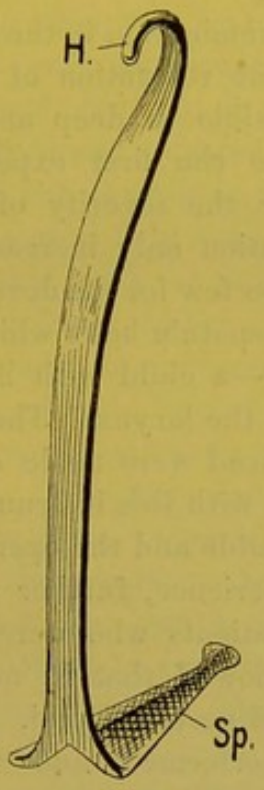

Fig. 2.—The spatula-hook in its earliest form. Made of *one* piece.
H. Hook. *Sp.* Spatula.

was produced. By suitable manipulation, and the mouth as wide as possible, a wonderfully clear view of the whole topography of the bucco-pharyngeal cavity, of the larynx, and of the entrance of the œsophagus was obtained, and I would strongly urge trying this experiment in the cadaver. Many points will be learnt which have hitherto escaped notice. The posterior pharyngeal wall appears in its whole length and breadth, from the uvula to the mouth of the gullet. Laterally the greater cornua of the hyoid stand out. The posterior surface of the laryngeal cavity is observed in its full extent, as well as part of the posterior tracheal wall. Only the anterior wall of the larynx remains concealed.

This observation impressed me so much that it became an incentive to take up anew the improvement of direct laryngoscopy. The possibility of carrying out the same in the living came into my mind, for thus not only the upper, but also the deeper parts, of the pharynx, and especially the interior of the larynx, would be accessible to eye and hand in a manner unsuspected. The situation suggested a comparison with the work of the gynæcologist, who is able, with the speculum in position, to use both hands in operating on deep parts.

The success of the examination in the living appeared to depend upon obtaining the same relaxation of parts as in the cadaver, and this was only possible in deep anæsthesia. I determined, therefore, to undertake the first experiments on anæsthetised patients, in cases where the severity of the disease justified an anæsthetic. This limitation only increased my difficulty, for such cases were altogether too few for the development of a new method. Accordingly the simple spatula hook which I had constructed was used only in three cases—a child with laryngeal papillomata and two cases of tubercle of the larynx. The spatula and the handle for suspension of the head were made out of one piece and an excellent result was got with this instrument. The interior of the larynx was easily accessible and the operation much simplified.

Guided by this experience, further attempts were made with cocaine alone on two patients who were accustomed to the direct method. The result showed that in neither was the procedure painful. They remained perfectly still. Suspension laryngoscopy was now frequently performed, and the instruments were so altered as to be suited for general use.

This looked at first a very promising start. But it proved very soon that a long way had still to be trodden. New spatulæ and forms of hook were constructed, tested and rejected, and, to be candid, I have not at the present time arrived at the ultimate goal. Although the instruments which I commend to you to-day have done excellent service they are not yet so perfect that they cannot here and there be improved upon.

As material in respect to patients was limited in Freiburg im Breisgau, it was fortunate at this juncture that I was transferred to the larger medical centre of Berlin. In the two and half years in which I have been there, my assistants and I have been much occupied with suspension laryngoscopy and we have succeeded in improving it. I would especially mention the help given by my pupil Albrecht. Our greatest difficulty arose from the fact that

the spatula, however carefully introduced, tended to alter its position and gradually slip out of the mouth. To prevent this and to obtain an exact view of the larynx we were obliged to make the original instrument more complicated. The handle had to have in relation to the spatula an angle of adjustable size, and in addition the instrument, when well placed, had to be properly fixed. At first a mouth gag was employed, but it proved more practical to effect the opening of the mouth directly with the spatula hook.

An obstacle for a long time was inability to see the anterior commissure. This could only be overcome by pressing on the cricoid externally with the finger. To do away with this, Albrecht made use of the counterpressor invented by my former assistant, Brünings. This answered the purpose so well that it has now been suitably attached. Also a good help is my newest gutter spatula.

Experience showed that only a proportion of adults would tolerate suspension laryngoscopy under cocaine alone or with the additional help of morphine. In children it was altogether out of the question, an anæsthetic had to be given.

In the clinic at Freiburg, there has long been a certain partiality for scopolamine injections. Morphine and scopolamine are injected subcutaneously before operation to render the patient insensitive, and to a certain extent they replace ether and chloroform. The good effect of scopolamine encouraged its employment in suspension laryngoscopy. If administered in suitable doses one can dispense with chloroform and ether in adults (children should never be given scopolamine).

These are the general principles which guided the development of the method. How they have been applied in detail will be described presently.

Before doing so I should like to mention that I described suspension laryngoscopy for the first time at the International Laryngological Congress in Berlin in 1911. Since then there has been a whole series of publications. I have also demonstrated it in the Berlin Medical Society, the Society of Charité Physicians, the Laryngological Society, the Congress of the German Laryngologists at Hanover in 1912, and again last year at the International Congress here in London.

In the meantime the method had been taken up by others and favourably reported upon. It appears to have been well received on all sides. From the literature I have taken in chronological order the names, Albrecht, Hölscher, Wolff, Brieger, Pollatschek,

E. Mayer (New York), from the years 1912–13, Davis, Gerber. Kaempfer, Kahler, Kleestadt, Freudenthal, Storath, Lautenschläger, Hopmann, Katzenstein, Mann, Froning, Iglauer, Steiner, Howarth, Chiari, A. Seiffert (Breslau), Henrich, Simoleki, Yankauer, Details are given in the bibliography. The papers of Albrecht and of Seiffert are especially worth perusal.

II. Instruments for Suspension Laryngoscopy.

The Tongue Spatula.

Attention was mainly directed to the tongue spatula and to its handle with the hook-shaped extremity. Since the discovery

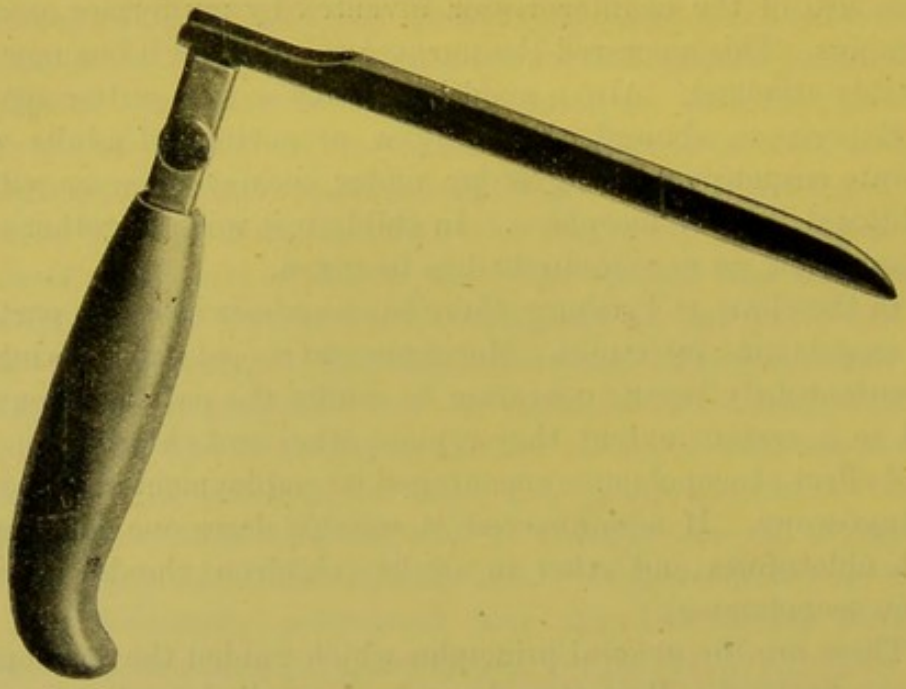

Fig. 3.—The gutter-spatula.

of direct laryngoscopy, tongue spatulæ of various forms have been constructed. Personally, I had worked with the tube spatula although I had always made use of the simple long narrow Kirstein's spatula as well. Later I suggested, instead of a complete tube, a split one in the form of a gutter having on cross section the form of a Roman V. Very firm pressure can be exerted by it on the middle of the tongue, and I have employed it in a somewhat modified form for suspension laryngoscopy from the commencement. Later it seemed to me I might get better results from a simple narrow spatula, the anterior end of which was heart-shaped. But more recently, having succeeded in materially improving the gutter spatula, I have come back to it.

It is essential to prevent the tongue bulging too much to the right or left at the side of the spatula and overlapping the gutter. Movable flanges have, therefore, been fitted to its sides. The

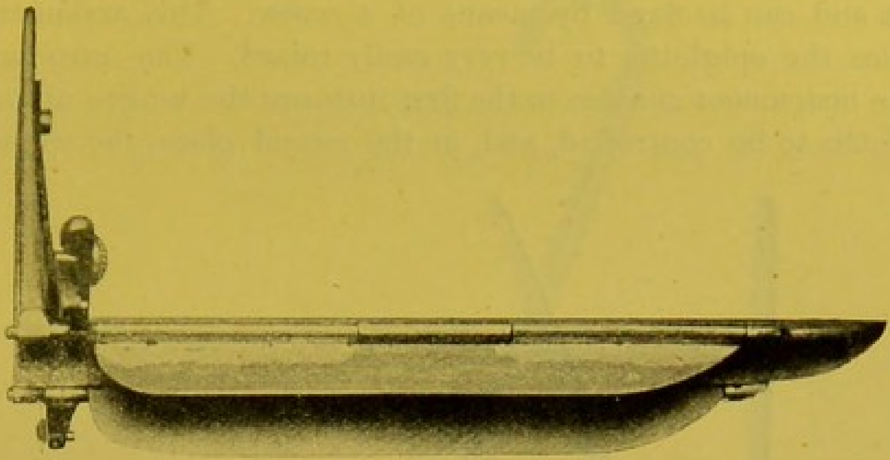

Fig. 4.—The flanged gutter-spatula. Both flanges are adjustable.

flanges may, by means of levers, be made to assume and retain the desired position. Such a spatula leaves little to be desired in the way of adaptability, and one ought, of course, to have it of different lengths.

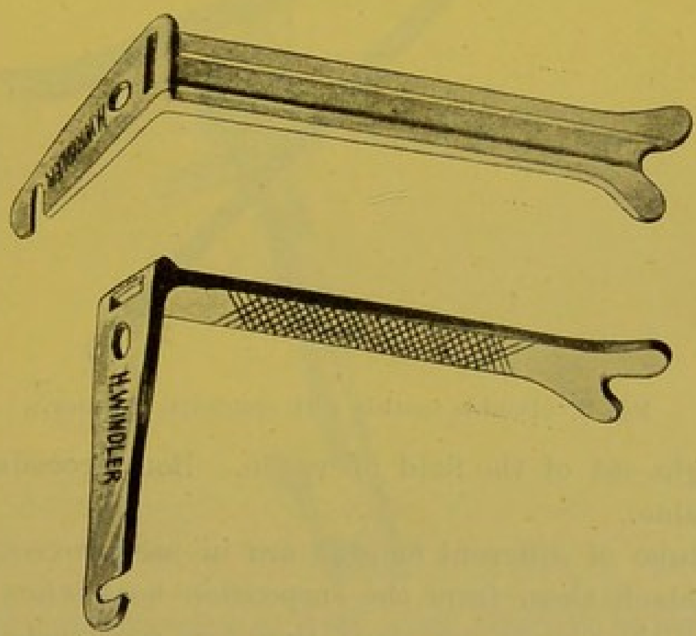

Fig. 5.—Double spatula without epiglottis elevator. Anterior end heart-shaped, behind is a slot through which the epiglottis elevator is inserted.

A second form has also proved of service. Not infrequently it happens that even a well-fixed epiglottis gradually slips from under the spatula and readjustment of the instrument becomes necessary. The epiglottis may be raised easily by means of a small rod, and

Albrecht has had a spatula made which can be extended whilst in position. Carrying out this idea, I have attached to the tongue spatula a second narrower and longer one which is inserted through a slot and can be fixed by means of a screw. This arrangement enables the epiglottis to be very easily raised. The introduction of the instrument enables in the first instance the tongue up to the epiglottis to be controlled, and, in the second place, the epiglottis

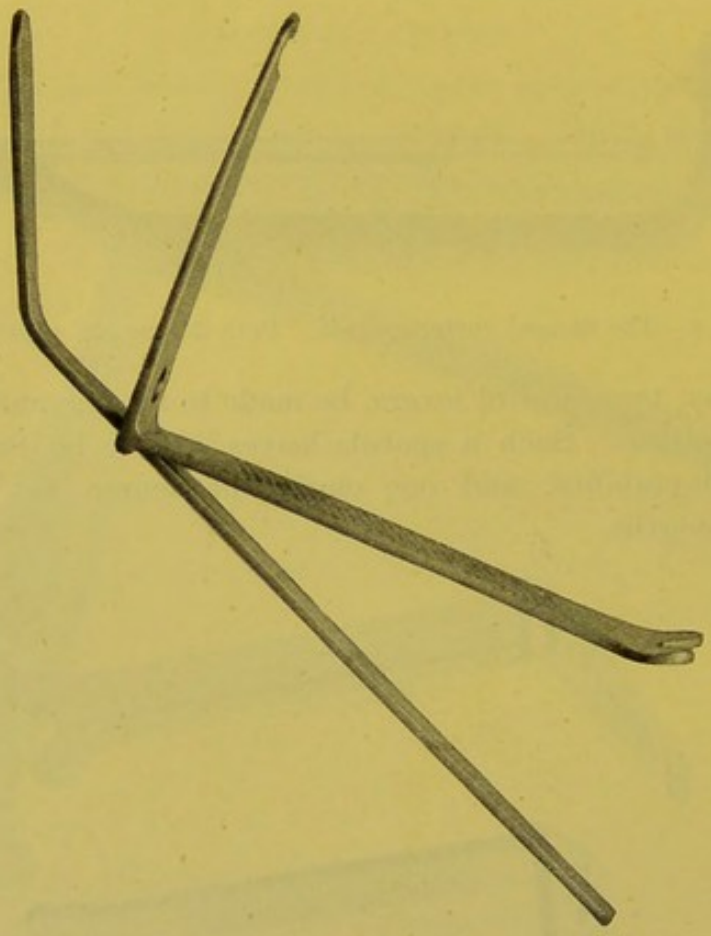

Fig. 6.—Double spatula with epiglottis elevator.

to be brought out of the field of vision. Both procedures are of practical value.

As spatulæ of different lengths are in use provision must be made to detach them from the suspension hook when necessary. The shaft of the tongue spatula is, therefore, constructed to permit this adjustment.

The Suspension Hook.

The tongue spatula had, as already mentioned, only a straight rod as handle, the end of which was curved in the form of a hook. A joint was then introduced in the course of the rod, but, later,

I thought this might be dispensed with. Albrecht, however, showed that slipping out of the tongue spatula might be prevented

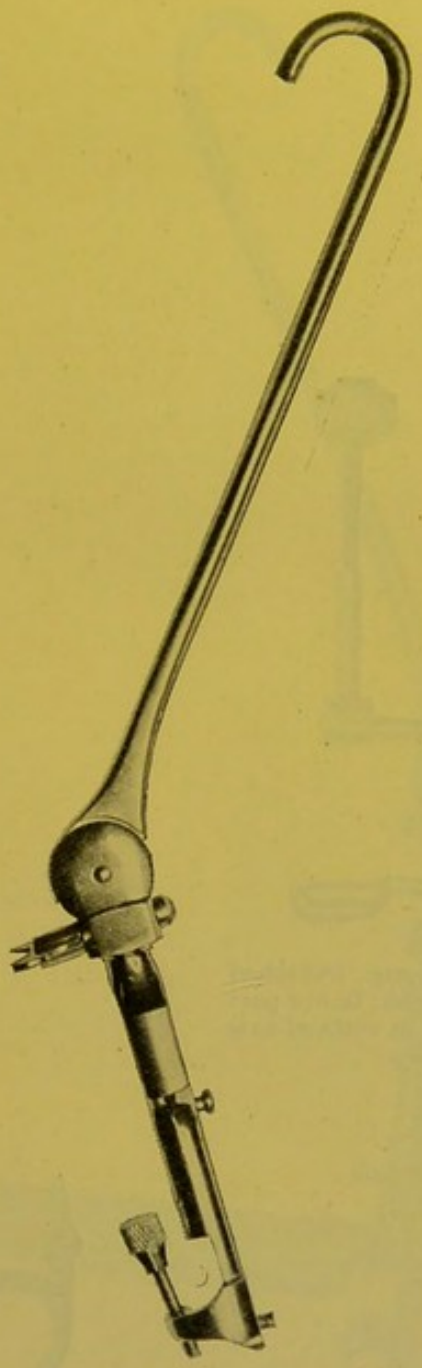

Fig. 7.—The suspension-hook by itself. Joint adjustable by thumb-screw. At the lower end screw for fixing epiglottis elevator. Behind, two pins for attachment of tongue spatula.

by making the point of suspension fall perpendicularly over the end of the tongue spatula or even in front of it, so that it appeared desirable again to provide the suspension-hook with a joint which could be adjustable. This is carried out by means of a thumb-

screw and a mechanism in which the principle of the worm-screw is adopted. On turning the thumb-screw in the direction of the

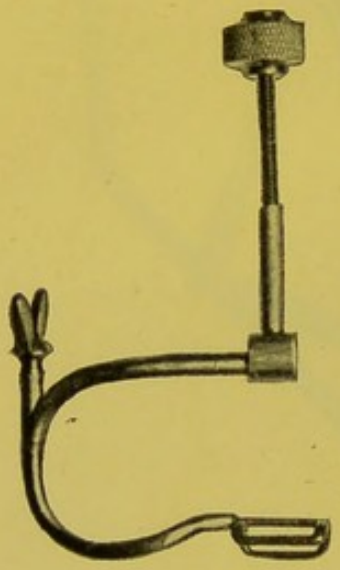

Fig. 8.—The mouth gag. Detached from suspension hook. Lower part of the gag turns on vertical axis and fixed by screw.

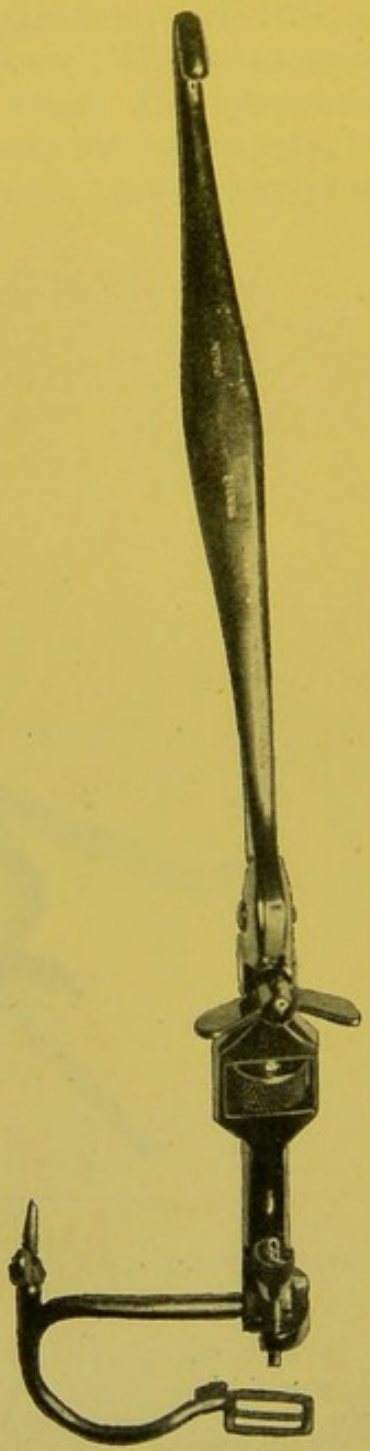

Fig. 9.—The suspension-hook with mouth gag.

hands of a watch, the hook is inclined towards the tongue spatula and a clearer view of the larynx is rendered possible.

To the part of the suspension-hook below the joint the tongue spatula is attached. It has also a particular arrangement. There

is a large screw which comes into play in opening the mouth. The second screw, on its anterior aspect, serves to fix the epiglottis-spatula.

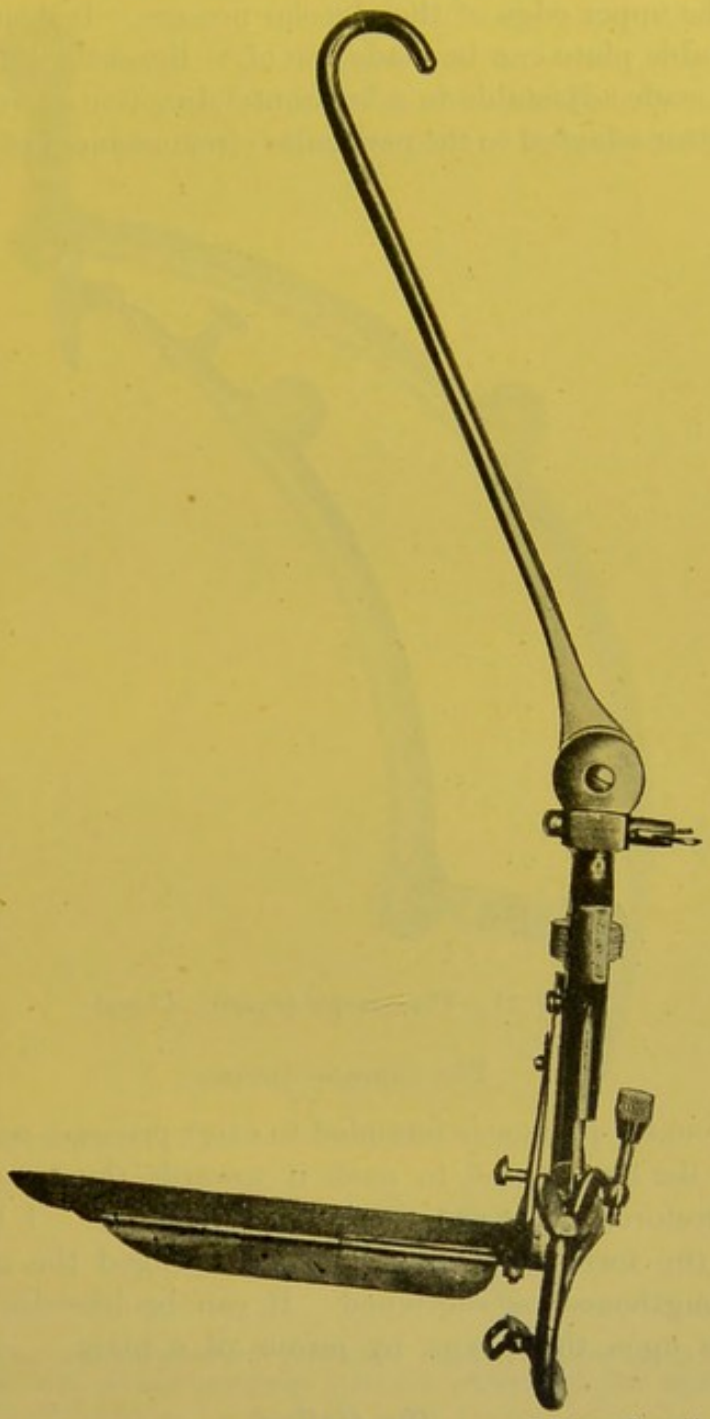

Fig. 10.—The suspension-hook with mouth gag and flanged gutter-spatula, seen from the side.

The Mouth Gag.

As the mouth of the patient must be held continuously open as wide as possible, a gag is absolutely necessary. This has the form

of a bow, which is fitted to the lower part of the spatula hook, and can be screwed up and down. The bow impinges by means of a small stop against the incisor teeth, or in an edentulous mouth against the upper edge of the alveolar process. Instead of the stop an adjustable plate can be made use of. Recently the bow itself has been made adjustable in a horizontal direction as well, so that it can be better adapted to the particular circumstances of the patient.

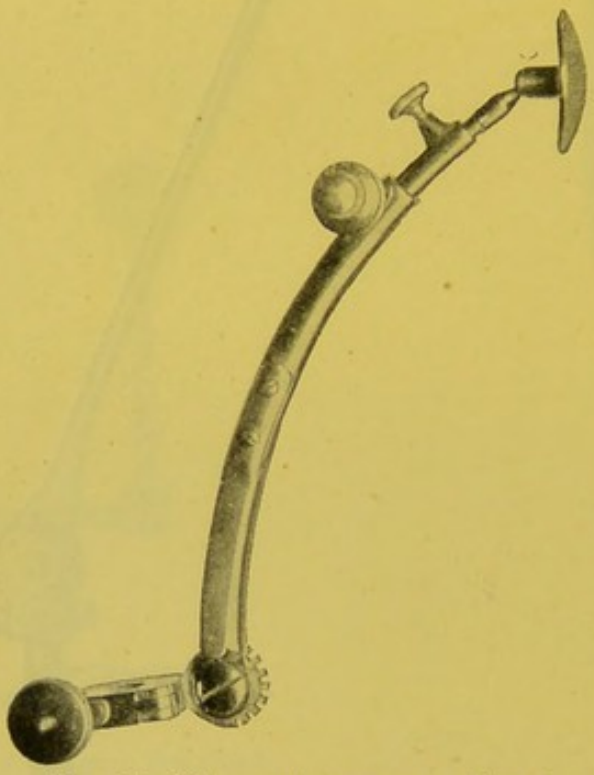

Fig. 11.—The counter-pressor. Closed.

The Counter-pressor.

The counter-pressor is intended to exert pressure on the cricoid region of the larynx and to push it towards the tongue spatula. It is, therefore, also fixed to the spatula hook. I have had it made in the form of a circle, and so arranged the curve that it can be lengthened or shortened. It can be likewise raised up. It presses upon the larynx by means of a plate.

The Gallows.

It is necessary to suspend the spatula hook, and the point of suspension must be in the position which the hook assumes after the introduction of the spatula. Special apparatus is, therefore, necessary to carry out rapidly and with ease all forms of adjustment, higher, lower, backwards, forwards. This apparatus, which

I have called the gallows, is screwed to the operating table. It consists essentially of an upright carrying a horizontal arm.

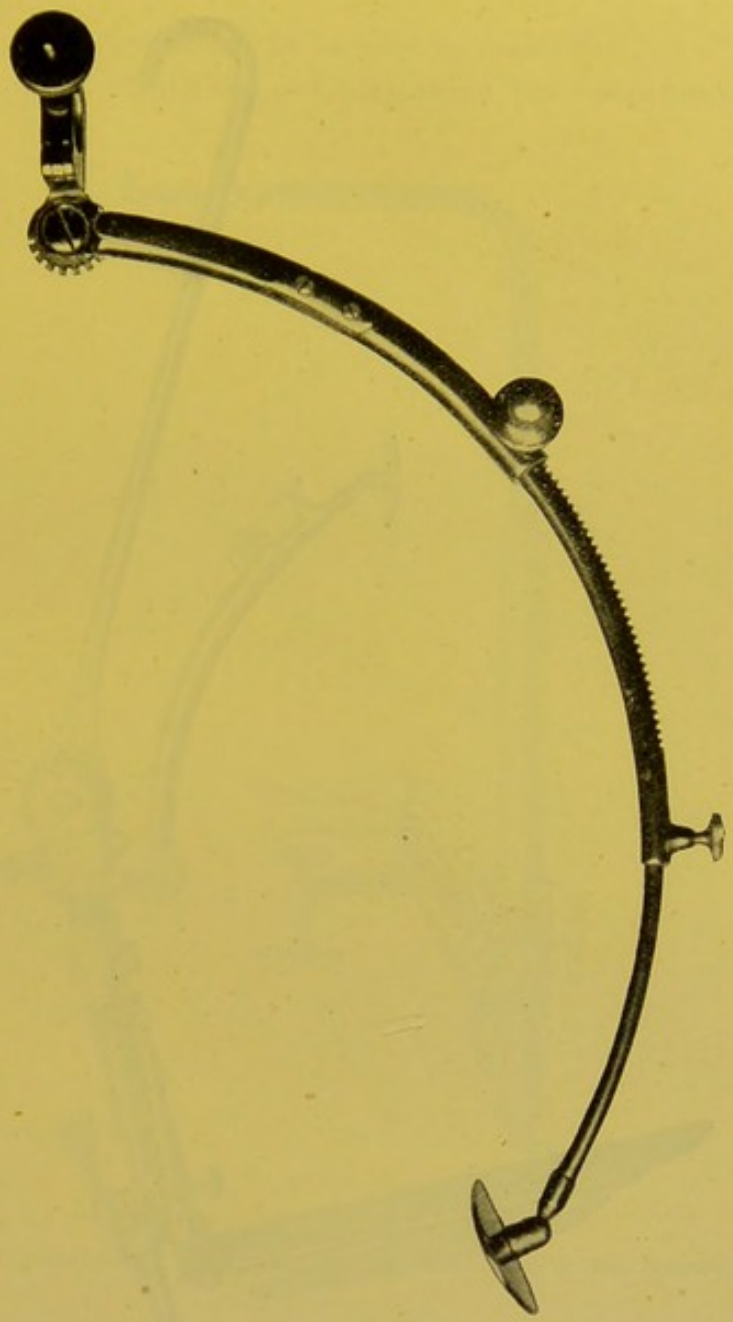

Fig. 12.—The counter-pressor. Extended. Anteriorly the plate which is placed on the cricoid cartilage. At the other end the attachment-mechanism and joint.

The upright is attached to the extreme corner of the top of the operating table. It can be placed higher or lower, and by means of a crank-handle to move backwards or forwards. From the upright projects a horizontal arm, which reaches to the middle of the operating table, and can itself be fixed higher or lower. The

adjustment of the upright gives the rough, that of the horizontal arm the more detailed, view.

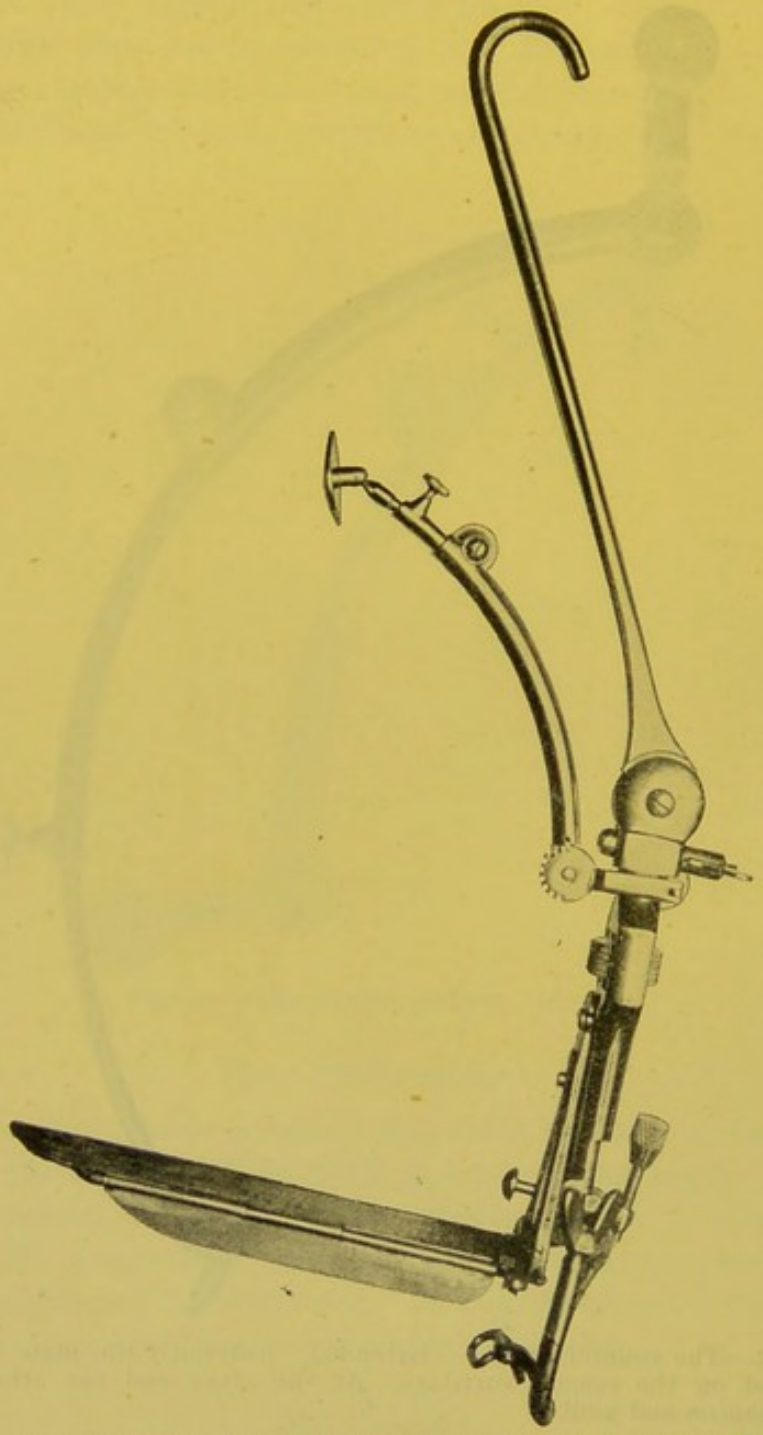

Fig. 13.—The suspension-hook with spatula and counter-pressor. Counter-pressor raised up.

The Operating Table.

Most operating tables are so constructed that the gallows can be attached. It was clear, however, that for suspension laryngo-

scopy they might be materially improved upon. The requirements are similar to those for the direct method on patients, in the back or side position.

The first desideratum is to be able to make the top of the table higher or lower. With the ordinary table the operator is usually

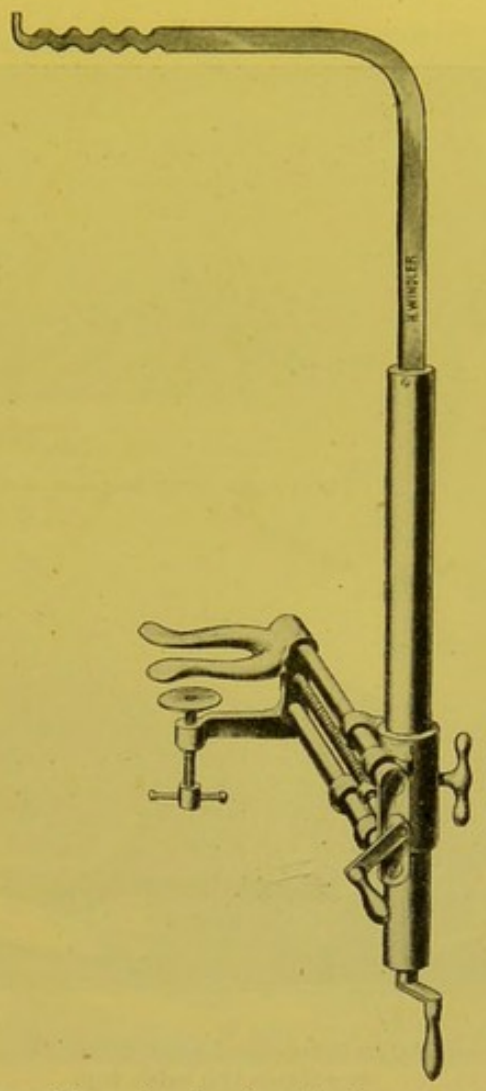

Fig. 14.—The gallows with mechanism for attachment to the operating table.

obliged to squat upon a stool or even to kneel. I have often had to carry out most difficult manipulations in cramped positions, which made it extremely fatiguing and prejudicial to success. Ordinary operating tables can be raised but little. They do not, as a rule, allow of the operator sitting upon a chair or standing, which is very convenient for demonstration. Kahler has had a special stool constructed, which may be screwed up as high as is necessary. I have had a new table so arranged that it can be raised unusually high. This is done by means of a crank-handle

manipulated by the operator himself. The top of the table can also be lowered and the back-rest adjusted. For the head a support adjusted by a handle has lately been introduced, so that the help of an assistant to hold the head is no longer necessary.

All operations usually performed by laryngologists may be done on this table, and in this respect it is not inferior to others.

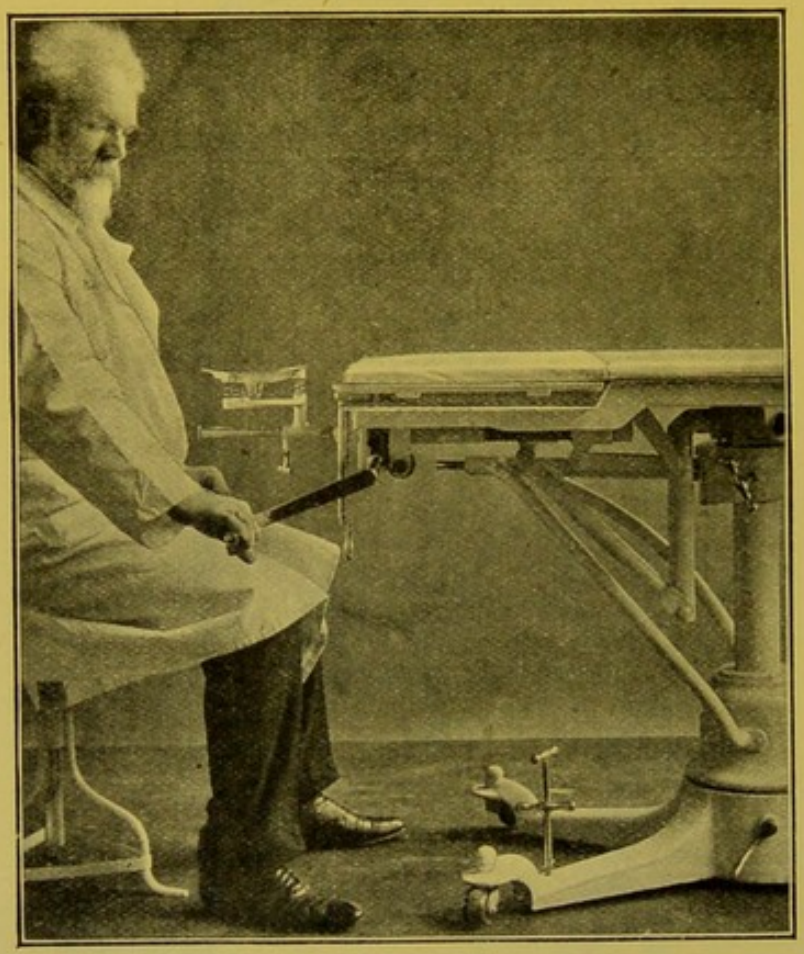

Fig. 15.—Operating table lowered. I am holding the crank-handle which regulates the table top.

Other Instruments.

For the protection of the operator from expectoration, especially in tuberculosis, a sheet of glass has been fixed to the gallows, so as to come between the surgeon and the patient. Single and double curettes of suitable form and length are necessary for various operative procedures, and so also are galvanocautery points for deep puncture. For hæmorrhage, instruments are made by the firm of Fischer, which permit the fastening and removal of clips in a manner similar to those used for uniting skin wounds or

controlling tonsil bleeding. Blumenfeld first recommended the use of such clips in the larynx.

III. Illumination.

In using instruments in suspension laryngoscopy, good illumination is, of course, required. It is possible, with a head-mirror and

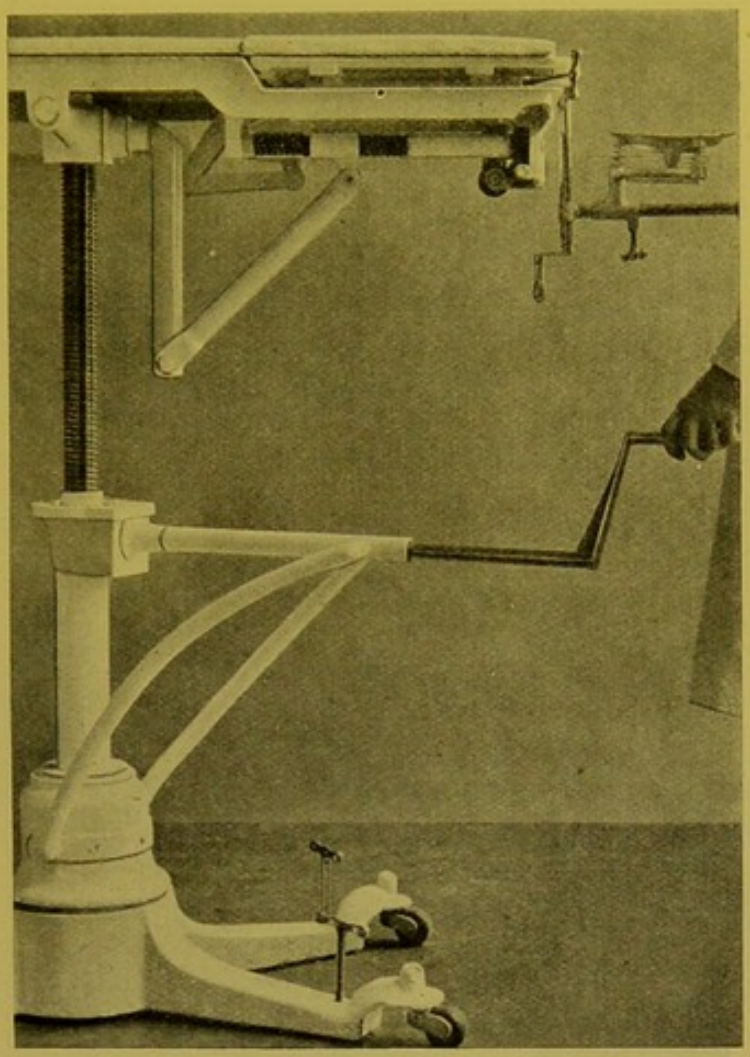

Fig. 16.—Operating table in raised position, by turning crank-handle.

a good lamp fixed to a stand or held by an assistant, to obtain sufficient light. The Nernst lamp, with the light concentrated by a lens, is quite suitable.

Personally I have always found very convenient the old Kirstein head-lamp, used as in other operations. Its drawback has always been that it is not aseptic in its construction. For this reason I have lately had made, by the firm of Wolff, an aseptic head-lamp, with a number of innovations. There is a

new form of joint which greatly facilitates focussing. The electric lamp has three crossed metallic filament-spirals giving a very strong light. The focussing lens can be adjusted by means of a screw. There is also an iris diaphragm to make the light circle larger or smaller. Its adaptability for demonstration purposes is not lost sight of.

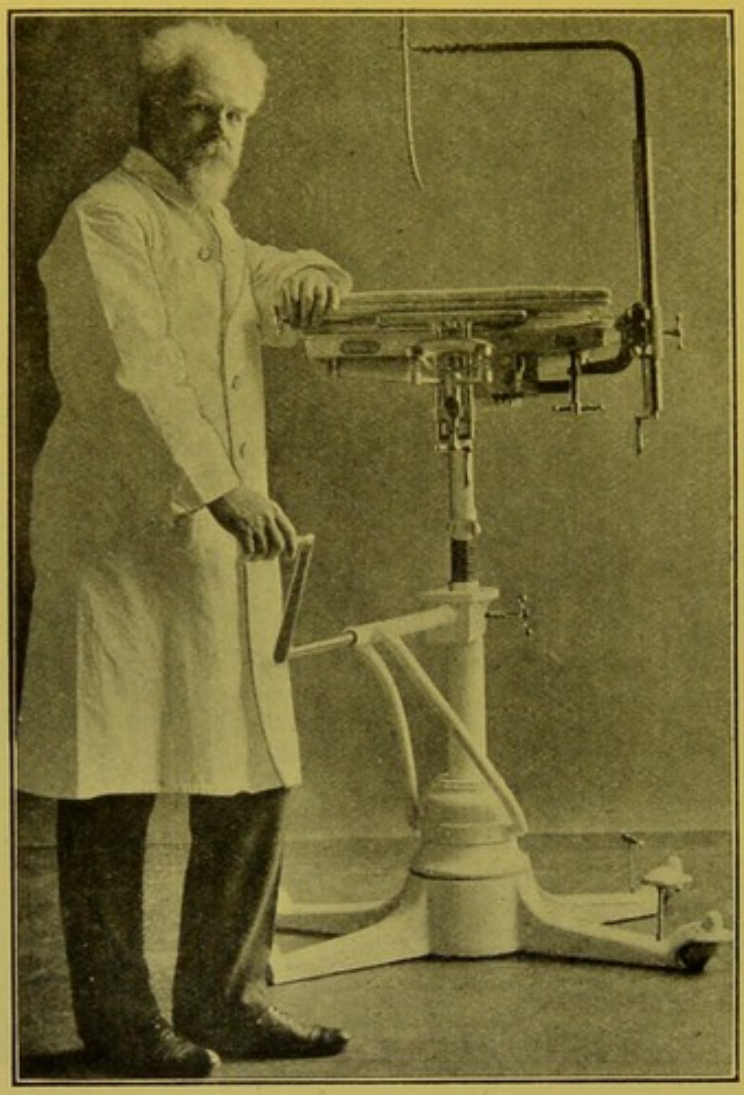

Fig. 17.—Operating table, head aspect. Table raised, gallows clamped on.

Quite new is the employment of a transformer suspended from the roof of the operating theatre. The rheostat swings by a cable free over the operating-table so that the flexible no longer drags on the floor, and, being covered with rubber tubing, it can be washed. The head-lamp and the rheostat are balanced by counter-poise, and one can work comfortably with the lamp on the head without the flexible dragging. The new installation has proved a success.

For demonstration purposes it is of advantage to have illumination by means of small electric lamps fastened either to the suspension hook itself or to its bow outside. Very effective is the method of having miniature lamps fixed on the end of the tongue spatula by a special apparatus. As may be gathered there are

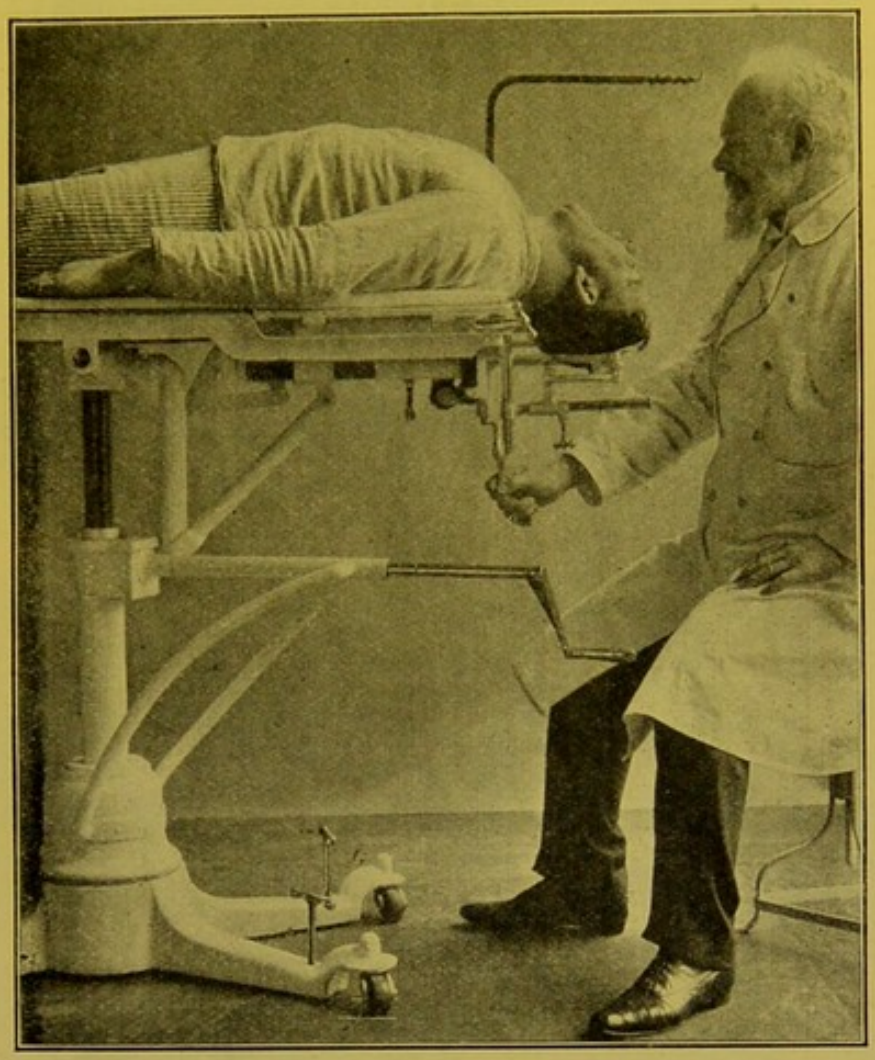

Fig. 18.—Operating table. To demonstrate the head support.

many ways of obtaining good illumination. Each operator can proceed according to his liking and to the purpose he has in view.

IV. Preparation of the Patient for Suspension Laryngoscopy.

All patients are not suitable for carrying out this procedure. Those who place difficulties in the way of introduction of tubes conduct themselves in a similar manner in suspension laryngo-

scopy. I refer to patients who do not open the mouth well, in whom the teeth in the upper jaw are very prominent, the tongue very thick and unyielding, and the larynx reached only with

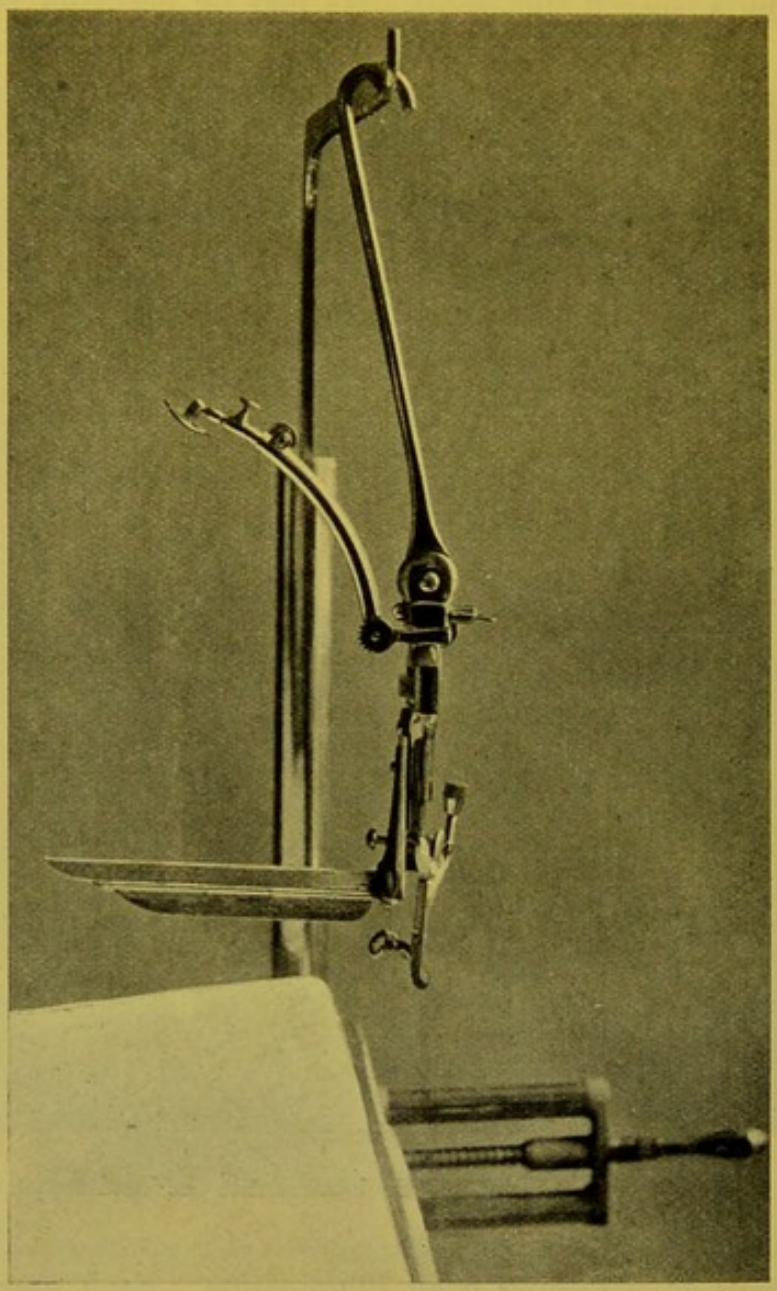

Fig. 19.—Suspension-hook with gallows on the operating table.

difficulty, by a narrow tube, from the angle of the mouth. In such circumstances it is hardly worth while to attempt the new method.

Before the patient is submitted to suspension laryngoscopy one ought to satisfy oneself as to his behaviour under direct examination. As a rule I introduce beforehand, with the patient sitting

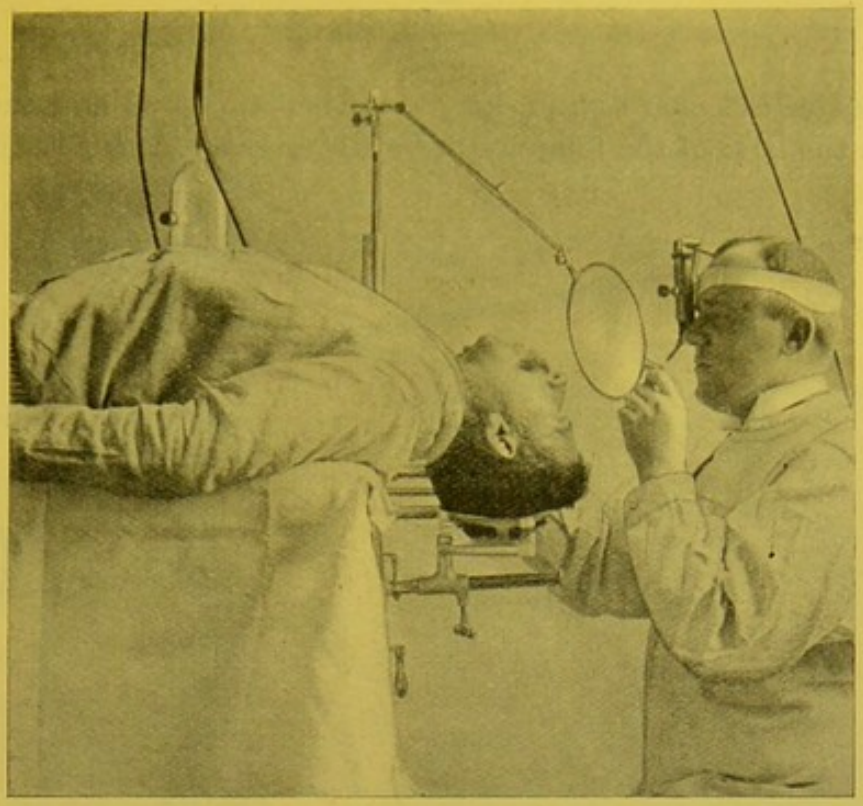

Fig. 20.—Glass protector on gallows.

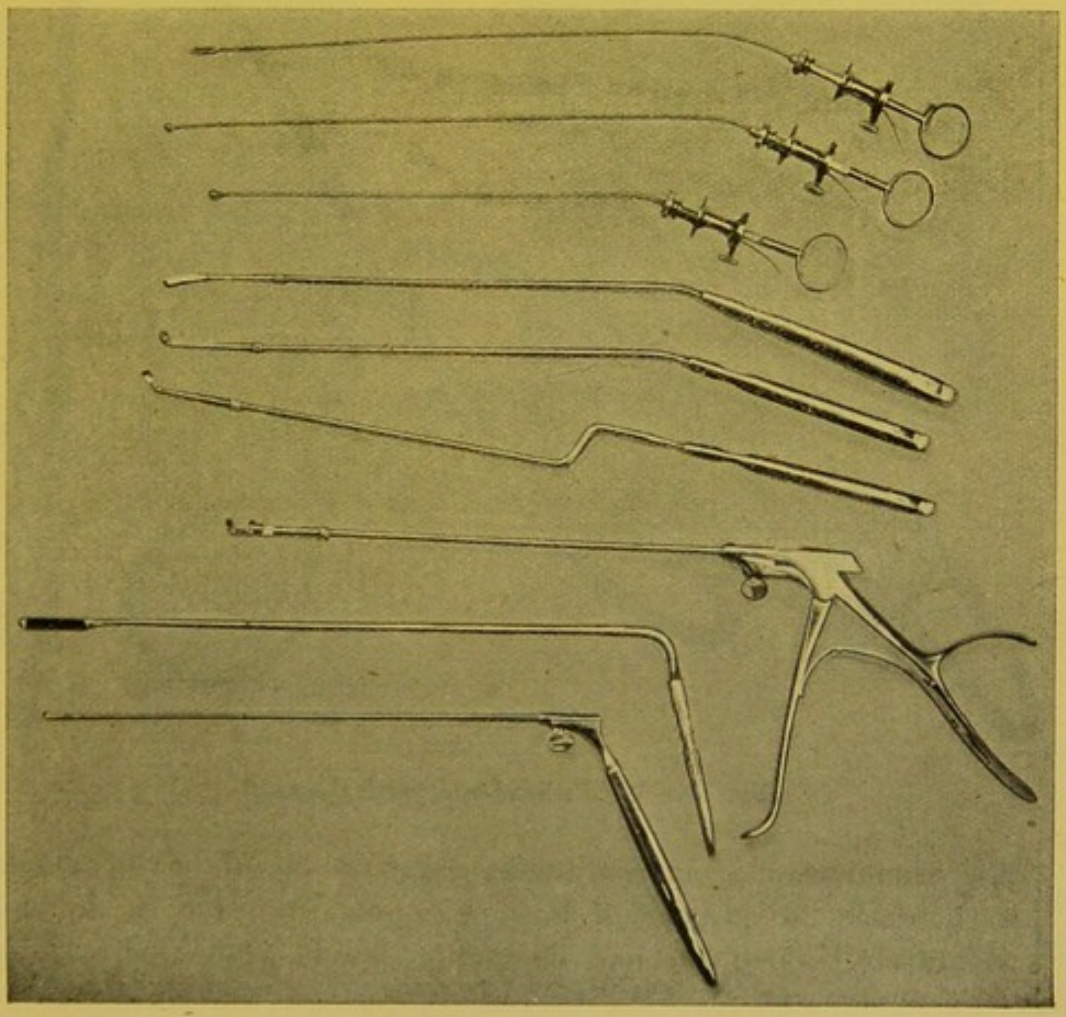

Fig. 21.—Operating instruments.

and under reflected light, a long tongue spatula, and find out how much the base of the tongue can be depressed. At the same time

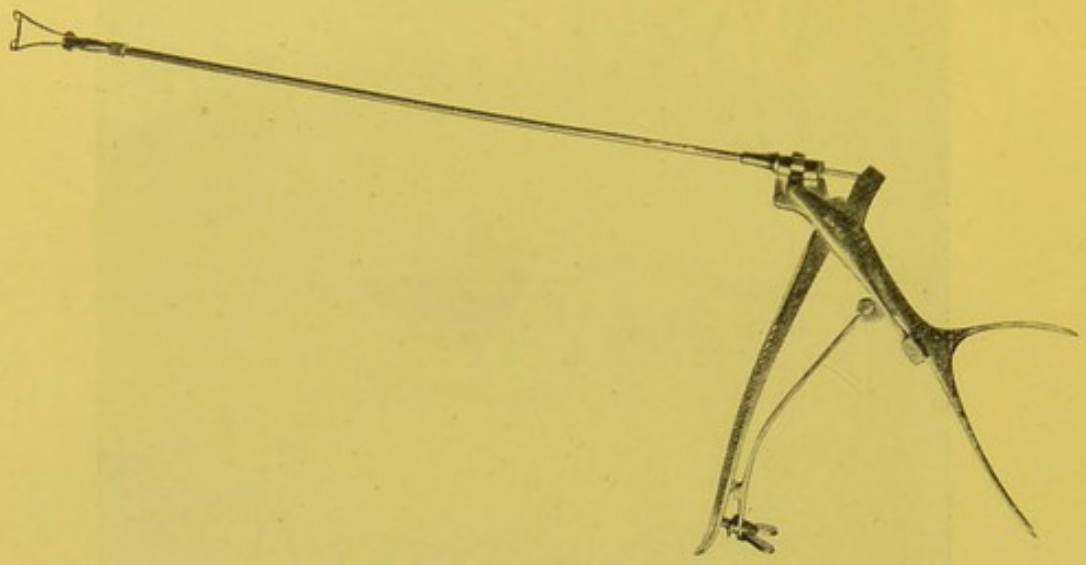

Fig. 22.—Fischer's clip-holder.

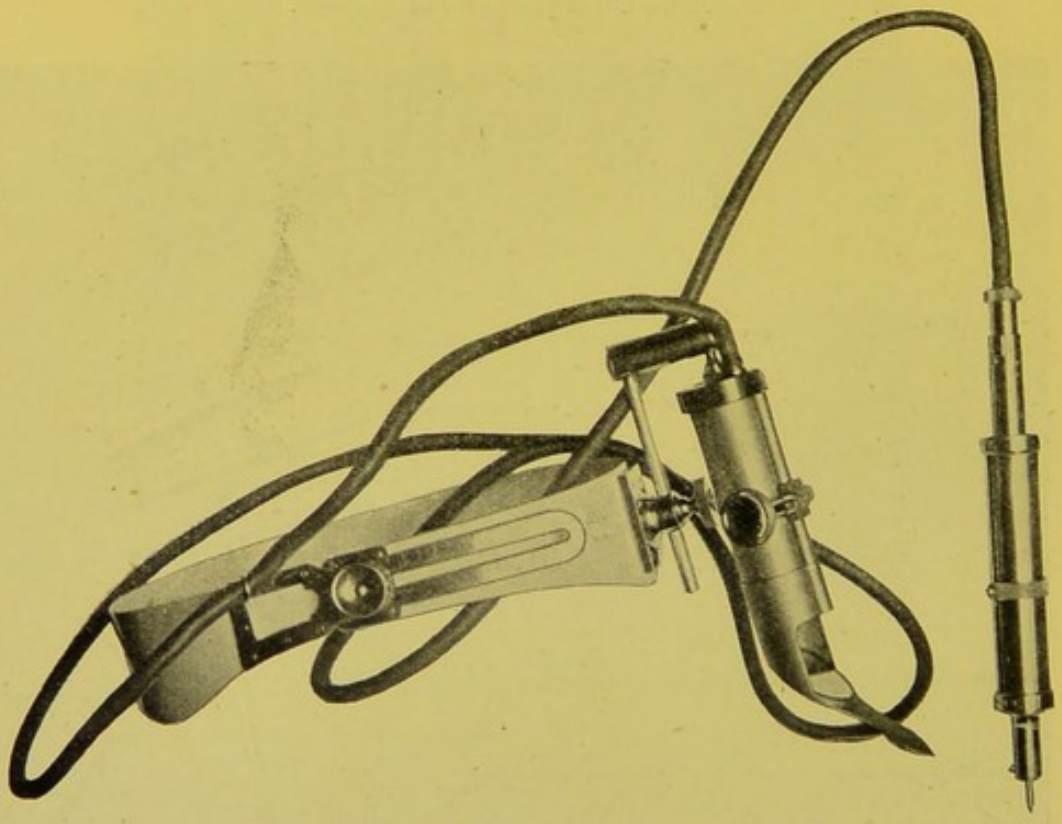

Fig. 23.—Wolff's head-lamp with rheostat.

this examination is utilised to determine the length of the spatula to be used in suspension laryngoscopy. In order to do this accurately Kahler has had Kirstein's spatula graduated in order

to measure the distance from the lower incisors to the base of the epiglottis. This is of great advantage.

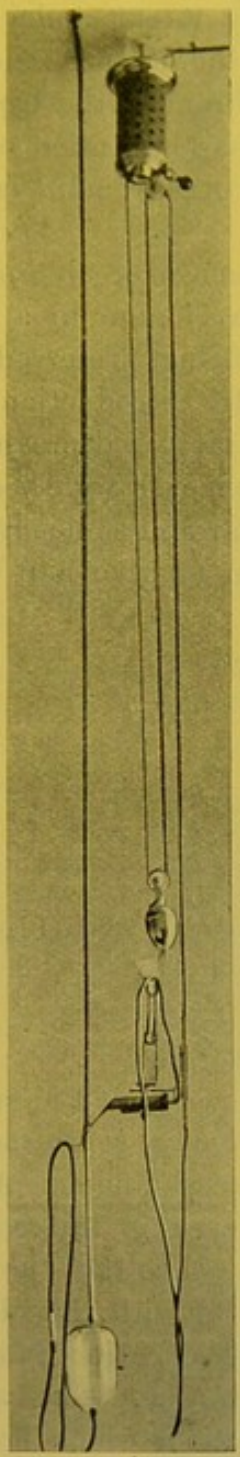

Fig. 24.—Transformer with head-lamp. The transformer is fixed to the ceiling of the operating theatre. Close by it, suction-tube with glass reservoir.

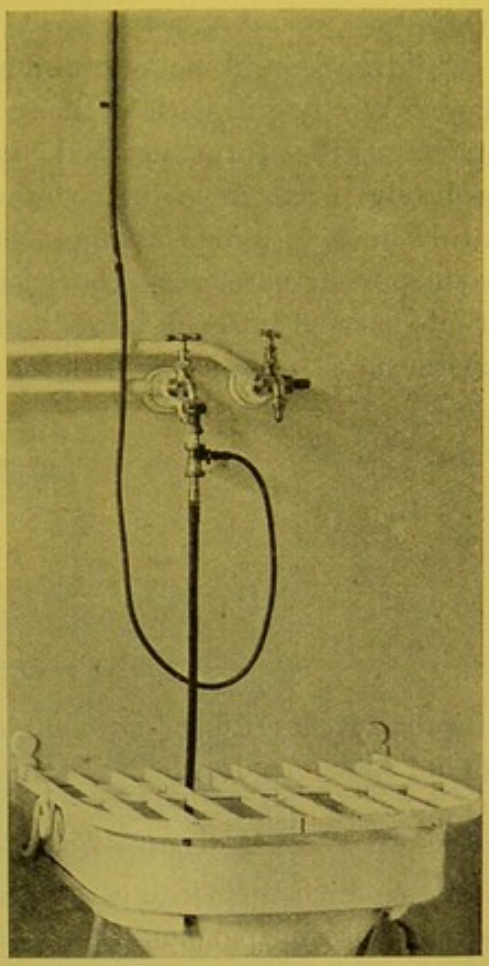

Fig. 25.—Water-suction air-pump. The tubing runs from the wash basin to the ceiling, and thence to the operating table.

In children this preliminary examination is unnecessary. In our experience suspension laryngoscopy can be carried out on them with ease. Women also in general stand it well.

The examination is best carried out in the morning with the patient fasting. If the cases are suitable and the patients not apprehensive, endeavour is made to carry it out under cocaine alone. For this I recommend especially the 25 per cent. spirit solution. It is applied to the mucous membrane of the base of the tongue, pharynx and larynx after previous application of the 20 per cent. aqueous solution. The addition of adrenalin is always helpful.

Children should be put under the influence of chloroform or ether. We begin with a mask and then change to a bellows apparatus, the form devised by Braun being preferred. It is absolutely necessary during and after the introduction of the spatula hook to blow the anæsthetic under increased pressure, into the deeper air-passages, otherwise with the mouth widely open too little is carried into the lungs and no regular and sufficiently deep anæsthesia is obtained. It is a good plan to give half an hour

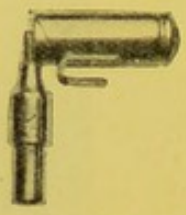

Fig. 26.—Miniature lamp for attaching to gag.

beforehand according to the age 5 to 10 drops of a 1 per cent. codeine solution in order to lessen cough reflex.

Morphine-Scopolamine Narcosis.

To produce this state of narcosis one proceeds as follows: Two hours before suspension the patient is given a centigramme of morphine and three decimilligrammes of scopolamine. An hour later the same quantity of both substances is injected. The operation room is darkened and quiet obtained so that the patient may fall asleep. It is not always successful with this dose, but deep sleep is not altogether necessary. The patient stands the operation quite well even if he is merely drowsy. One can carry on a conversation with him and give directions which he readily follows.

I would point out that with scopolamine and morphine cocainisation of the larynx is by no means superfluous. As a rule, the cocaine brush should be passed several times into the larynx, especially in the tuberculous. I generally have the patient lying on the operating table with the head moderately bent back, and

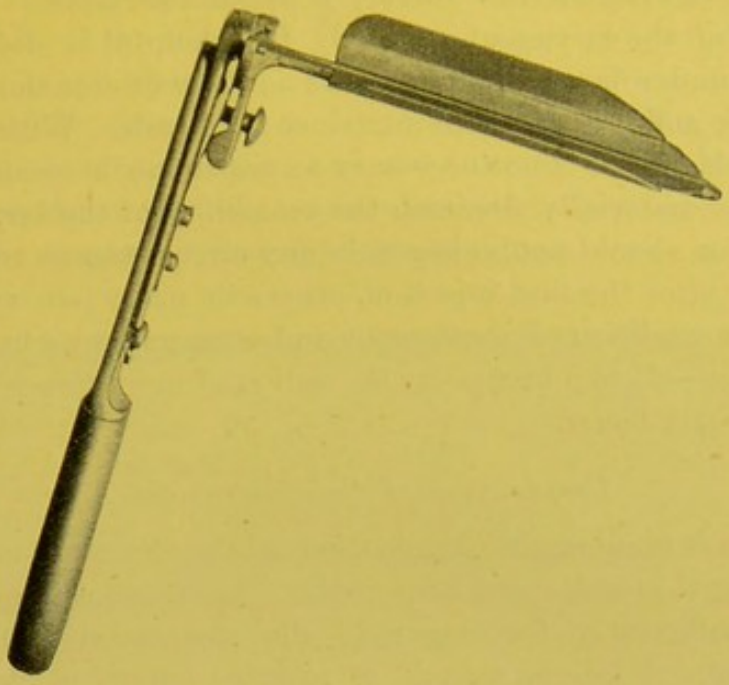

Fig. 27.—Handle for tongue-spatula. Each tongue-spatula can be tried beforehand with this handle.

Fig. 28.—Braun's bellows apparatus for general anæsthesia.

using the electric frontal mirror, I brush the larynx under the guidance of the laryngeal mirror. It is helpful in doing this to have the under jaw pulled forwards as it facilitates the view into the larynx and it is easier to introduce the brush. With morphine and scopolamine it is not necessary to use so much cocaine as both substances materially diminish the sensibility of the larynx. The examination should not be begun in any circumstances earlier than two hours after the first injection, otherwise many patients get into a peculiar condition of excitement and often resist. One can well wait longer—2½ to 3 hours—as the action of morphine-scopolamine lasts for some hours.

Preparation of the Instruments.

Before beginning the examination all the necessary instruments are arranged in order and inspected. The operator ought to make himself sufficiently familiar with the suspension hook and its mechanism. A tongue spatula of suitable length is fitted to the hook and the counterpressure apparatus fixed above. The gag is adjusted to the minimum distance. Before the introduction the mouth spatula is so arranged that it forms a gutter. An inclination towards the tongue spatula is given to the hook by turning the thumb-screw. It is inclined so that the end of the spatula hook comes to lie perpendicularly over the point of the tongue spatula. In this form the instrument should be introduced.

The patient lies flat upon the operating table. The body is drawn up so that the head projects free over the edge of the table. It is held in this position by the head support.

The cocainising of the larynx, especially of the epiglottis and also of the posterior pharyngeal wall and of the tongue, follows. If these parts are sufficiently insensitive, the spatula hook is taken and the head is depressed somewhat by lowering its support.

Introduction of the Tongue Spatula.

This procedure is easily learned. Those skilled in the practice of the direct method will find no special difficulty. Our task is to pass the spatula under illumination to the posterior pharyngeal wall and then to move it down to catch the epiglottis safely. The introduction of the spatula is facilitated by pulling out the tongue and holding it. This is, however, not absolutely necessary. The tongue spatula readily pushes the tongue downwards if it is not fixed, so that it is well to have it pulled out to enable it to be seized and held.

In introducing the spatula, an endeavour is made to keep exactly to the middle of the tongue. If the epiglottis is seen one glides over it and lifts it upwards. This tilting movement is so made as not to cause the instrument to slip out, its object being to expose to view the arytenoid region and the interior of the larynx. If this is successful an assistant must so arrange the gallows that the hook can be suspended from its horizontal arm.

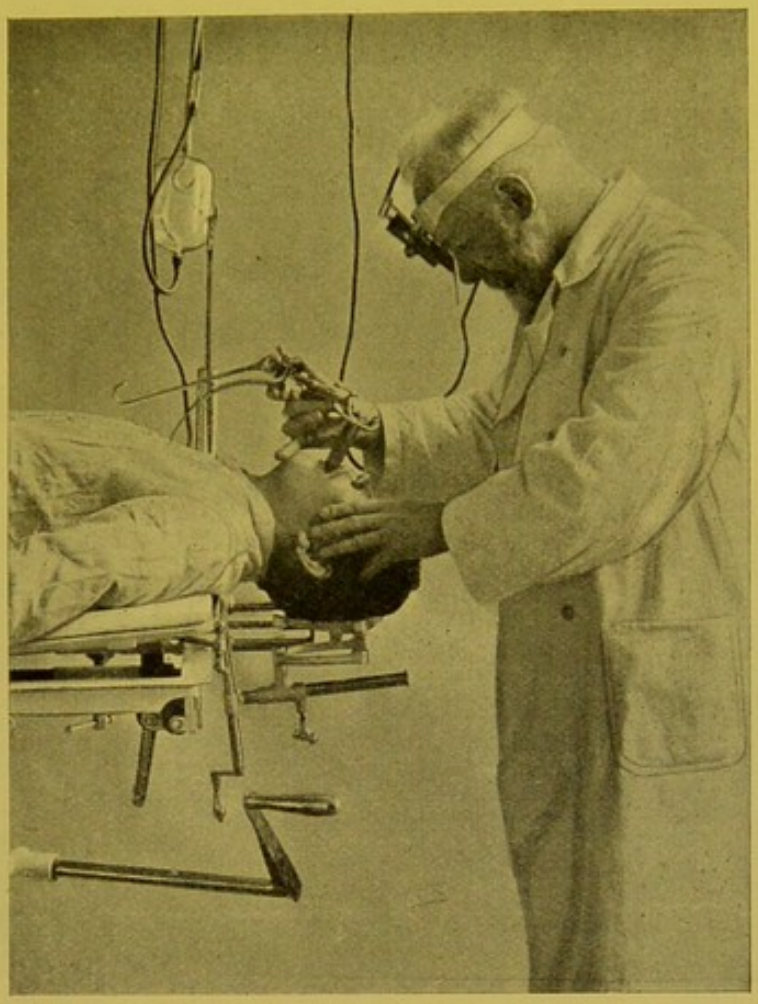

Fig. 29.—Introduction of the suspension-hook.

It is only when this stage is reached that the mouth-gag is set in action. Its stop is pushed over the teeth of the upper jaw, the bar fixed and then screwed up as far as the patient's mouth can be opened.

The complete view of the interior of the larynx is only possible when the head support is screwed so far down that the head hangs freely on the tongue spatula. For a more detailed view it is essential to turn the thumb-screw of the spatula hook in the

direction of a watch hand. The hook itself will then incline still further towards the spatula.

The anterior commissure usually comes into view only when pressure is made upon the cricoid. We press tentatively with the hand and then apply the counterpressor. This is accordingly

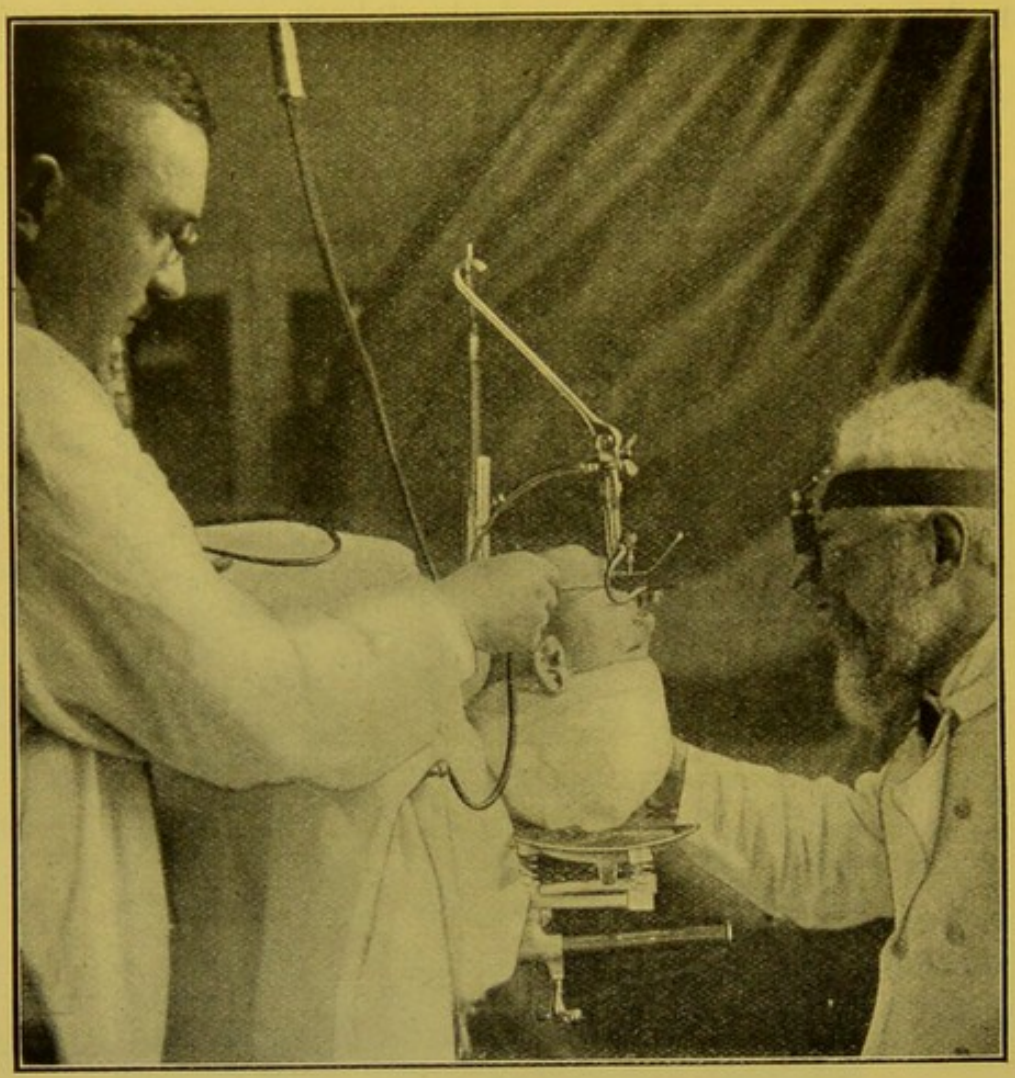

Fig. 30.—Suspension laryngoscopy.

brought down and so lengthened that its plate rests upon the cricoid region. This can be done by turning the screw and making the desired pressure.

If all these manipulations are carried through successfully the interior of the larynx is revealed to view and remains so as long as desired.

The view of the larynx can be achieved in two movements. The tongue spatula is first introduced over the tongue up to the epiglottis, the hook suspended, the gag put in position, and the

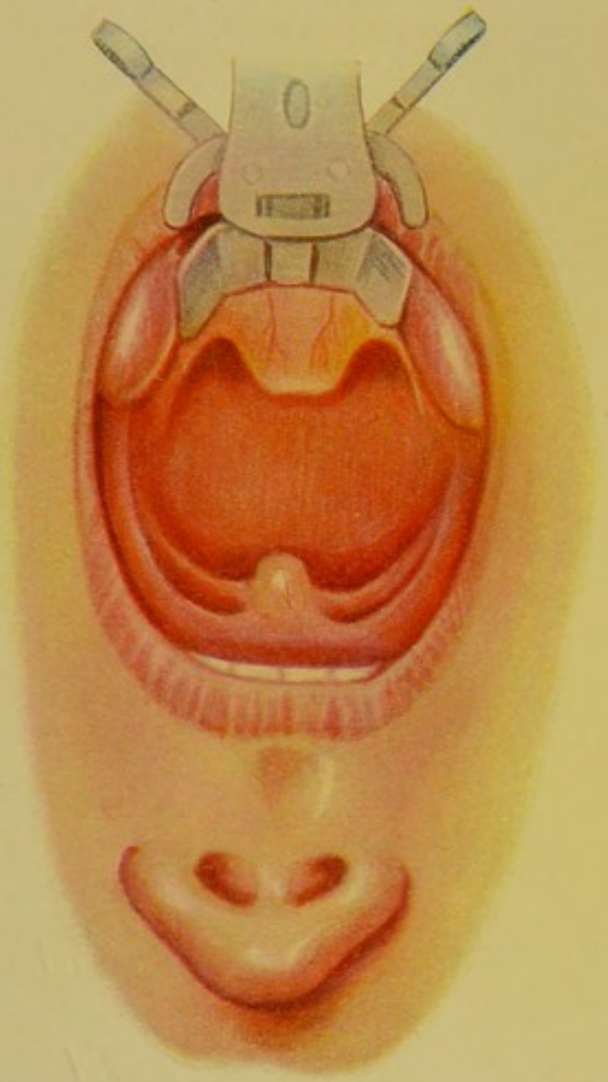

Fig. 31.—The view in suspension laryngoscopy. The epiglottis exposed.

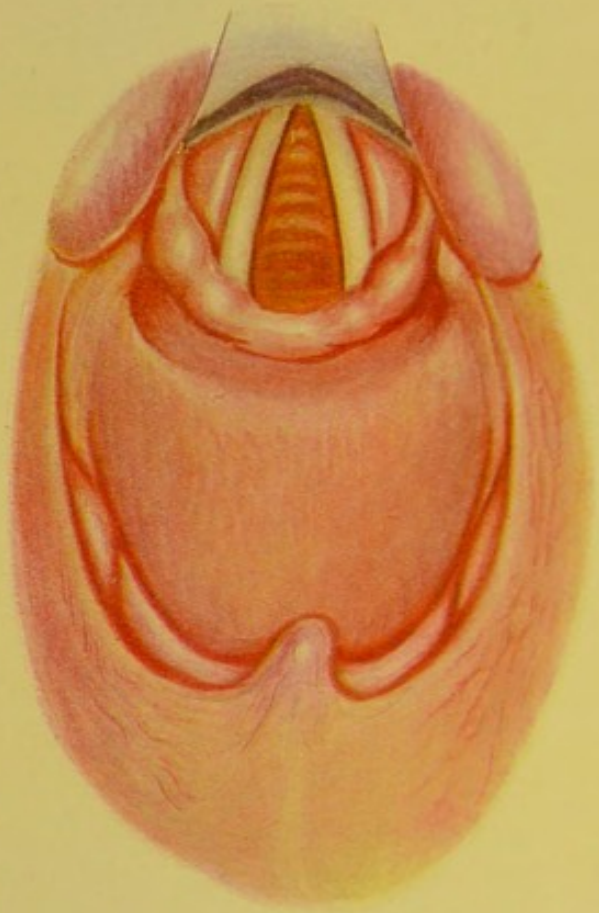

Fig. 32.—The view in suspension laryngoscopy. The larynx exposed.

To Illustrate Professor Gustav Killian's Paper on Suspension Laryngoscopy and its Practical Use.

head brought into free suspension. This satisfactorily done, the narrow epiglottic elevator is introduced, pushed well down under the epiglottis and tilted up. The elevator is then fixed with the position screw. If the larynx is in view, the operating table is so adjusted that one can see comfortably, sitting or standing.

If the view of the larynx with the tongue spatula and the suspension hook is successful, the patient is in a situation which can be best understood from an illustration. It is seen that one limb of the suspension hook which carries the tongue spatula is vertical, the second limb being inclined obliquely backwards. It is easy to understand how the tongue spatula hooks itself in this way deep in the pharynx, a position which prevents it from slipping out. The position is excellently shown on skiagrams taken from the side with the instrument *in situ*.

Certain objections have been advanced against suspension laryngoscopy. Many believe it to be a painful procedure. I can, however, easily show that pressure on the tongue alone is well borne by patients, and that even the fully introduced spatula produces hardly any discomfort. In order to convince themselves of this, two specialists—Hopmann, of Cologne, and Seiffert, of Breslau—submitted themselves to suspension laryngoscopy. They experienced only an uncomfortable pressure against the teeth and some tension in the region of the faucial pillars. Where the spatula has remained in position one may notice sometimes in the next few days here and there on the epiglottis a small pressure mark, which soon disappears.

The View of the Buccopharyngeal Cavity and of the Larynx in Suspension Laryngoscopy.

The new method shows the larynx in general very much as we are accustomed to see it in the direct method. An essential difference is that a complete view is obtained over the whole larynx, pharynx, and mouth cavity. The immediate neighbourhood of the larynx projects more plainly, the pyriform sinuses gape, whilst the arytenoid region and even at times the beginning of the cricoid plate come forward from the vertebral column. The laryngeal interior appears extended slightly in length in a sagittal direction. The cords are somewhat less freely movable. On deep inspiration a part of the anterior tracheal wall may be seen whilst the epiglottis is covered by its spatula. By lessening the inclination of the head a further extent of the trachea may be seen.

The whole topography of the pharynx and larynx can be taken in simultaneously at a glance, and is so easily intelligible that even a layman can make it out. There is no difficulty in the access of instruments to particular parts. Although the intra-laryngeal manipulations naturally demand a certain amount of practice, this is not in the least to be compared with that required for indirect laryngeal work.

V. Practical Application of Suspension Laryngoscopy.

Demonstration.

The new method lends itself excellently to the demonstration of the interior of the larynx and its pathological alterations to a large circle of students. The demonstrator has practically nothing to do provided the illumination by the small lamp is sufficient. He can stand quietly by and give the necessary explanations. Pathological conditions can be easily seen and correctly interpreted by the students. As specially suited for demonstration I would recommend laryngeal polypi, papillomata, slight cases of tuberculosis and even recurrent paralysis.

Minor operations can also be shown as, for example, the removal of a polypus or curetting.

Compared with the tiresome demonstrations with the mirror the progress made is very welcome. It is a pleasure to put a probe into the hand of a student and ask him to touch a particular spot with it. If the anæsthesia of the larynx is sufficient, it is always successful.

It has been thought by many that with suspension laryngoscopy, operative treatment may pass out of the hands of the laryngologist. I have no such fear. One must be a laryngologist to be able to recognise the correct indications for employing the method. Whoever would use it with success must be familiar with the anatomy, physiology, and pathology of the region as well as with its examination.

Clinical use of Suspension Laryngoscopy.

Notwithstanding the short time since its introduction the new method has been used frequently with the best results, not only by myself and my pupils but also by a large number of laryngologists in various countries, as the bibliography testifies.

From the point of view of diagnosis it is of value, especially in childhood, and, indeed, in all cases where the simple, direct

method is made use of. The only contra-indication here is marked dyspnœa. With some practice the introduction of the spatula in children can be done very quickly, and even in difficulty of breathing the larynx can be exposed to view (tracheotomy instruments should, of course, be at hand). With the larynx in sight immediate tracheotomy is no longer necessary in dyspnœa, as a tube of suitable calibre can be passed through the glottis. Seiffert has also pointed out that artificial respiration can be done with the suspension hook in position.

A whole series of affections of the larynx in children come up for diagnosis, especially where the cause of changes in the voice and breathing has to be determined. There may be revealed a simple acute or chronic catarrh, a subglottic swelling or false membrane, a croupous or diphtheritic affection, or node formations on the cords, papillomata, tubercle, syphilis, perichondritis, or a foreign body. It is of value in congenital defects of the larynx and in cases of difficult decanulement.

It gives information on the condition of the hypopharynx. It can be further used in small children in preparation for tracheotomy, bronchoscopy, as well as œsophagoscopy. If the tongue and epiglottis are held up with the spatula, the tube may be introduced easily and carefully, and this may be repeated without much harm. Before such manipulation the larynx should be slightly cocainised, even where the child is under a general anæsthetic. If this is not done passing the tube is apt to induce a stoppage of breathing from irritation of the pneumogastric nerve, which may be overcome by artificial respiration.

The literature already contains a large number of clinical reports upon the use of suspension laryngoscopy in children. They refer mostly to papillomata, vocal cord nodes and foreign bodies.

Laryngeal Papillomata in Children.

Of late we have had many opportunities of removing by suspension laryngoscopy recurrent papillomata in small children. Albrecht has written fully on this subject and has reported a number of cases. From the fact that papillomata often recur even after thorough removal, it frequently happened that the same child had to be repeatedly subjected to suspension laryngoscopy. Although many children had considerable dyspnœa when placed on the table, nothing untoward ever occurred.

The larynx of the child is so accessible in suspension laryngoscopy that the papillomatous masses are readily seen. They can be removed entirely in one sitting and tracheotomy thus avoided, in certain circumstances. For the removal we use a narrow double curette rounded anteriorly, which can be supplemented by the sharp spoon. The larynx is then brushed lightly with a 1 per cent. salicylic acid in spirit. To prevent recurrence we have found the administration of iodide of potash and arsenic of good service.

It appears to me that recurrence is best prevented by radium or mesothorium. Polyak and I had already proved that radium caused the disappearance of laryngeal papillomata, and lately, favourable reports of it have come from Chiari's clinic. With the larger quantity of radium or mesothorium now available, papillomata have, as a matter of fact, been caused to disappear. In future they ought to be removed in suspension laryngoscopy and a mesothorium capsule immediately introduced into the larynx. For further particulars the papers of Albrecht, Wolff, Kleestadt, Mann, Katzenstein and Seiffert should be consulted. Albrecht has succeeded in permanently freeing the larynx from papillomata in a number of children. Kahler observed by suspension laryngoscopy in a child, aged three and a half, numerous papillomata in the hypopharynx and the entrance of the gullet, which were easily removed.

Vocal Cord Nodes in Children.

In small children who cry a great deal, small nodes not infrequently develop on the vocal cords and lead to persistent hoarseness. They are usually associated with slight chronic catarrh. They are mostly found in children who, in consequence of hypertrophy of the pharyngeal tonsil, thickening of the inferior turbinate, as well as septum deviation, etc., suffer from deficient nasal breathing. The direct method under a general anæsthetic is used for diagnosis. Suspension laryngoscopy is here well adapted, as Seiffert and Katzenstein have pointed out, the nodes being easily removed by it.

Tubercle, Syphilis, Difficult Decanulement, etc., in Childhood.

Though tubercle in the larynx in children is very rare we have observed it and in suspension laryngoscopy curetted it. No case of syphilis has been recorded.

With regard to difficult decanulement the condition of the sub-

glottic space and of the trachea has to be examined and granulations removed if necessary. For this purpose it may be necessary to pass a tube through the glottis. This I have done and Seiffert has reported a similar case.

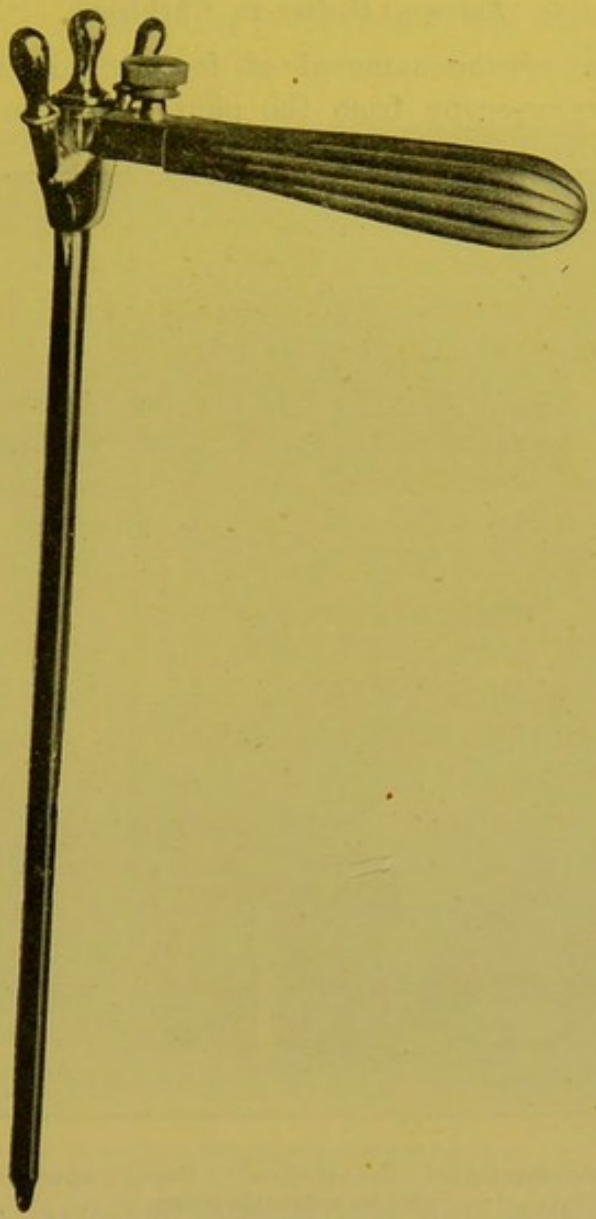

Fig. 33.—New three-channelled tube for bronchoscopy in children.

In this connection a word may be said on the use of suspension pharyngoscopy. If a broad spatula, which does not extend far down, be attached to the suspension hook the pharynx is very easily made accessible in small children and operations can be performed, such as tonsillectomy. Albrecht and I, as well as Freudenthal, have done it in small children under general anæsthesia. With the head dependent, the tonsil is seen upside down. Its upper pole is below and the technique of extirpation

m ust be modified accordingly. The blood will run into the naso-pharynx and disturb less. Bleeding may be controlled by compression or by artery forceps and clips.

Foreign Bodies in Children.

Experience of the removal of foreign bodies by means of suspension laryngoscopy from the pharynx of small children is

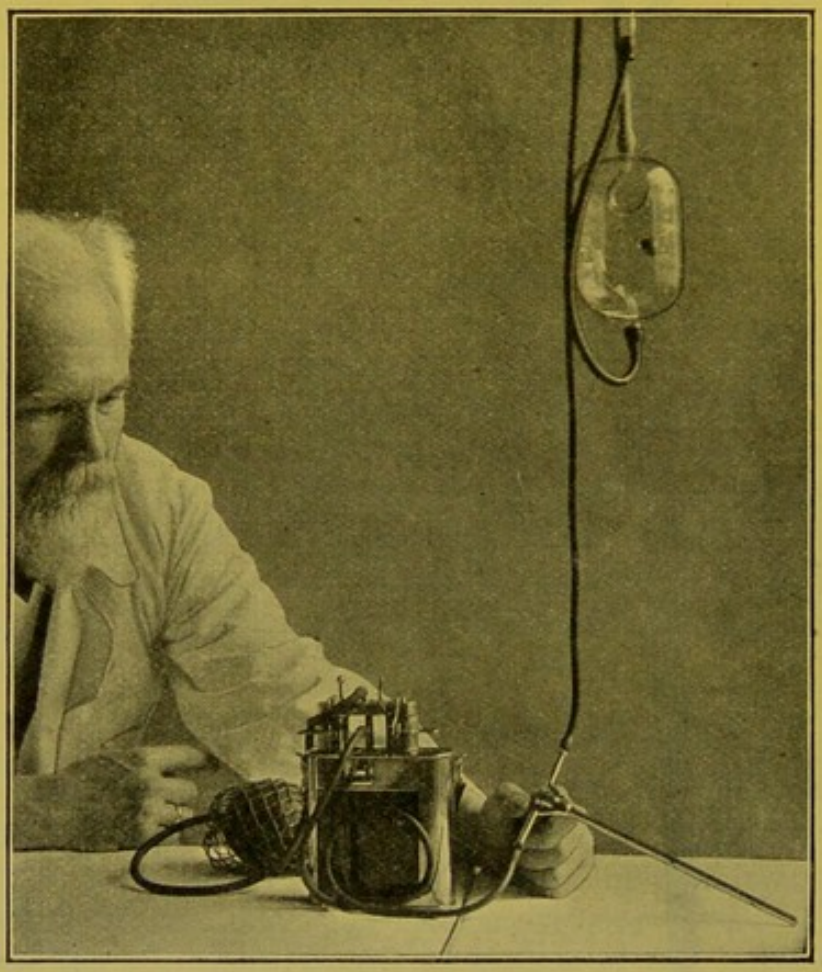

Fig. 34.— Three-channelled tube attached to Braun's anæsthetic apparatus and to water air-pump.

still somewhat limited, but nevertheless very encouraging. Davis appears to have been the first to remove, in a child eleven months old, a safety-pin from the pharynx. My assistant, Weingartner, recently extracted in a similar manner a piece of bone impacted in the entrance of the larynx and pharynx. Seiffert reports the removal of a flat bone from the subglottic space in a child five years of age, and Iglauer removed a portion of a safety-pin from the larynx, which had lain there five months. Both observers

agree that the diagnosis and extraction presented no special difficulty.

An important question is raised whether suspension laryngoscopy facilitates the introduction of the tube in bronchoscopy in young children. As difficulty is frequently met with in introduction, I exposed to view the larynx in two cases of foreign body,

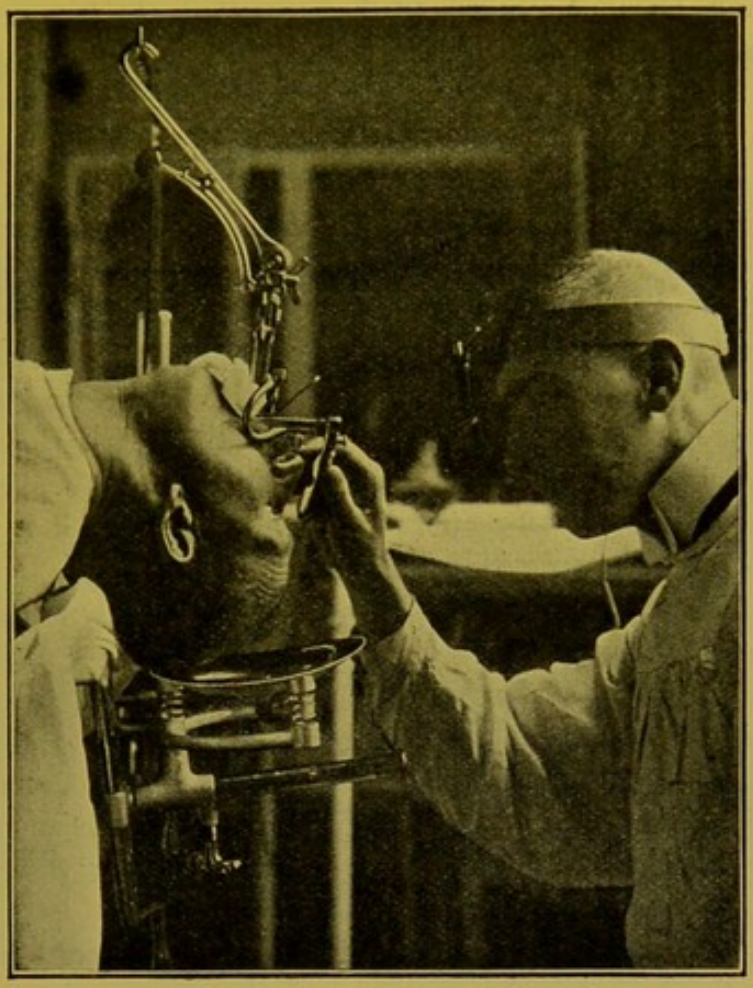

Fig. 35.—Suspension bronchoscopy.

cocainised the laryngeal entrance, and then carefully passed the bronchoscopic tube down through the glottis. I succeeded in removing with great ease a metal sheath from the right bronchus. In a similar manner I got from the left bronchus of a two-year-old child a nail which had lodged there for a year and had produced bronchiectatic suppuration. The bronchoscopic tube used on this occasion was of special construction. It had two fine lateral pipes, one of which extended to the end of the tube, and served for suction of secretions by means of a water pump; the second reached only half the length and enabled chloroform to be

given continuously during the bronchoscopy, thus keeping up an equable anæsthesia. It greatly facilitated the extraction of the foreign body.

Suspension Laryngoscopy in Adults. Tuberculosis of the Larynx.

The treatment of laryngeal tuberculosis has at all times given the laryngologist much anxiety and trouble. It was rarely possible to do much because a more vital organ than the larynx, viz. the lung, was generally affected. It was only when we learned to improve the condition of the lung by residence in a sanatorium that better results were obtained in the larynx. Whilst treatment formerly was more or less symptomatic, it later on assumed a more active form. An attempt was made to remove the affected parts in the larynx by operation, or to produce a cure by measures which destroyed the diseased tissue. On account of the great irritability of the phthisical patient this treatment was very troublesome, took up time, and caused the patient much discomfort and suffering. As only very little could be done in one sitting with the single or double curette it was always an unfulfilled wish to shorten the local treatment as much as possible. I have often felt it would be a great boon to the patient if the major part were done at one time. After treatment would be materially shortened and sanatorium treatment might be sooner begun.

Since the introduction of direct laryngoscopy operative treatment of the larynx has made marked progress. Curettage, as well as the deep puncture by the galvanocautery recommended by Grünwald, could be carried out with the greatest precision through the tube spatula. Something was lacking, however, which has now been supplied by suspension laryngoscopy. It has laid bare to the operator the whole laryngeal region. He could now work with both hands, using the curette and the mop at the same time. Patients were found to tolerate quite well in one sitting an extensive curettage and even deep puncture of an infiltration.

The outlook from the therapeutic point of view is now quite different. Sanatoria are accessible to the poor; the number of the tuberculous who get no appropriate treatment has much decreased and they no longer flood out-patient departments and consulting rooms.

For small tuberculous foci sanatorium treatment is sufficient. Definite infiltration, or ulceration, or extensive involvement of the larynx is removed in suspension laryngoscopy by curette or cautery and the patient then transferred to a sanatorium.

With regard to technique minor manipulations may be carried

out forthwith under a morphine injection and cocaine. For more extensive operations and in very irritable patients morphine-scopolamine narcosis is well adapted. The operator should have between the patient and himself a glass screen to protect against being coughed upon. The single curette, which can be rotated, is the best ; occasionally the double form is required.

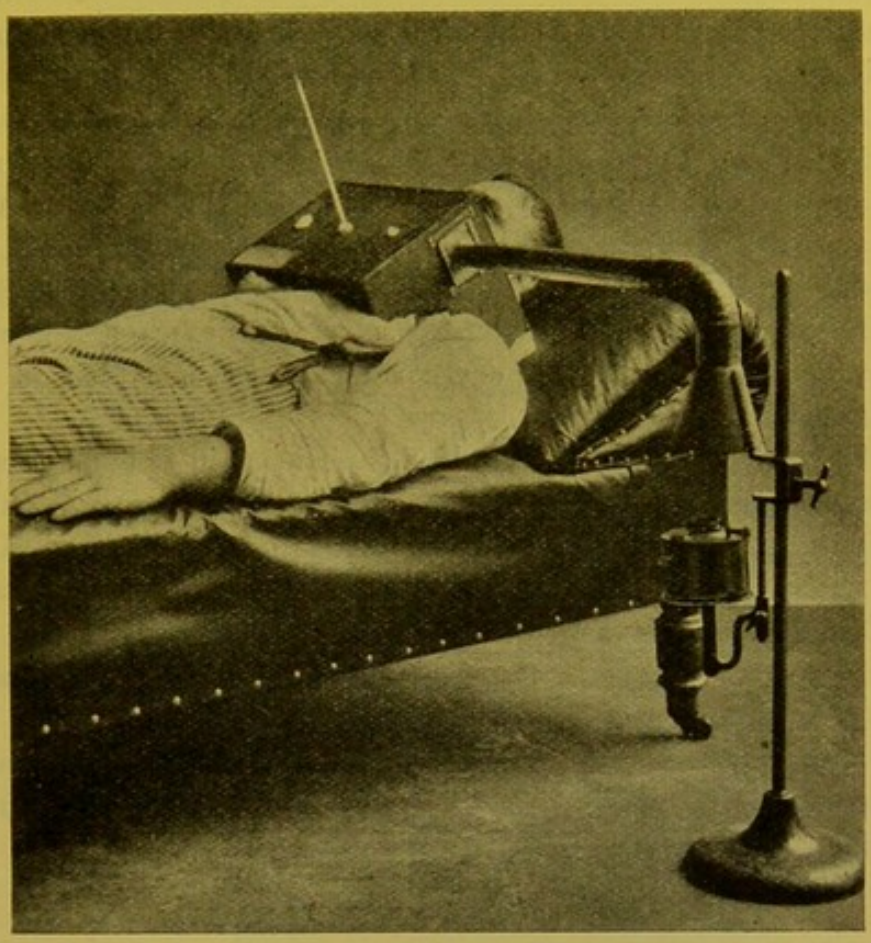

Fig. 36.—Albrecht's hot-air box for the neck.

With such active treatment I have never met any serious bleeding. If it should happen, the larynx is sufficiently accessible in suspension to apply an astringent or even a clamp. Blumenfeld arrested laryngeal hæmorrhage by means of a clip applied under the laryngeal mirror, and Fischer now makes instruments for fastening clips in suspension laryngoscopy. For disinfection of the parts after the operation iodoform or vioform may be insufflated.

This treatment is followed by reaction for a few days. The mucosa becomes injected and œdematous in places. The patient

should therefore be kept quiet and forbidden to speak so as to avoid increasing the reaction. In œdema, Albrecht's hot-air bath, which is useful in other laryngeal affections, is excellent. Hot air induces active hyperæmia of the larynx and leads to absorption of the exudation.

It is astonishing how clean the wounds and ulcers in the larynx look some days after the curettage in suspension. I have seen nothing like it hitherto, even after prolonged treatment. In favourable cases, the fresh surfaces soon cicatrise under lactic acid applications.

During the first few days, some pain in swallowing is complained of and there is almost always some rise of temperature similar to what is met in consumptives under the most varied conditions. But it very soon falls. As after-treatment, administration of iodide and the application of hydrogen peroxide, as suggested by Pfannenstiel, give the best results. Only after this should lactic acid be used. An early radical treatment has at times rendered tracheotomy unnecessary.

We have dealt with a number of patients in this manner, and others have reported very favourable results in laryngeal tubercle treated in suspension (*e.g.* Hölscher, Freudenthal, Seiffert, Kahler, etc.).

Brieger and his assistant Seiffert have already tried direct application of X-rays to the interior of the larynx—a treatment said to be promising.

Lupus of the larynx, especially its extensive form, is amenable to treatment in suspension laryngoscopy, and recently Simoleki operated on a scleroma in this way.

Benign Growths of the Larynx.

Although simple neoplasms are very easily removed under the mirror, suspension laryngoscopy will often prove of value in cases of difficulty. It is especially adapted for extensive growths. Much more can be attempted and carried out with greater precision. At times it will obviate the necessity of an external operation.

Removal of a polypus from the vocal cord is extremely simple and even the unpractised may perform it in suspension. Hölscher, Steiner, Chiari, and others report cases.

Cancer of the Larynx.

Suspension laryngoscopy ought to render important service in laryngeal cancer. In cases of difficulty, removal of a part for

examination will be facilitated. Very small growths and suspicious places have hitherto been removed under the mirror or through the tube spatula. Areas on the cords, on the epiglottis or on the aryepiglottic folds can be treated in this way. Suspension laryngo-

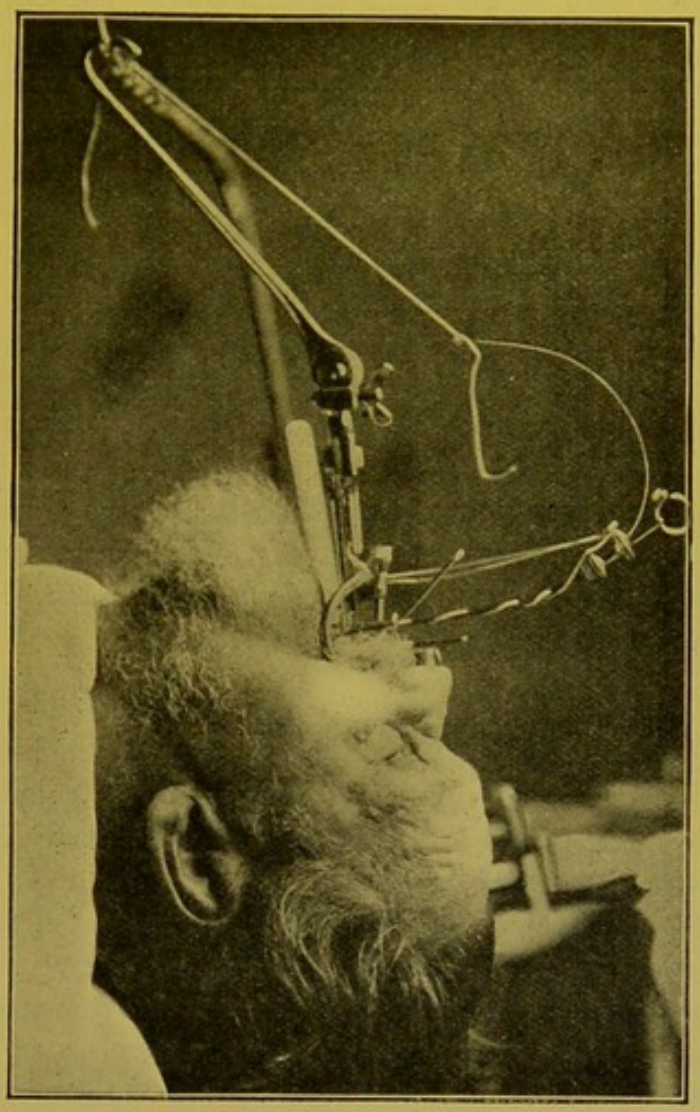

Fig. 37.—Application of mesothorium in suspension laryngoscopy.

scopy enlarges this field of usefulness, but the limits of intralaryngeal removal should be very definite. E. Meyer reports excision of a carcinoma from the epiglottis. Such cases, it is needless to say, ought to selected with care.

In treatment by radium and mesothorium, suspension may present certain advantages for their introduction. I have treated a number of cases with mesothorium and tried various methods. Many tolerate it fairly well if the mesothorium capsule, fixed to a wire or to a slender rod, be introduced into the cocainised larynx

and the wire placed between the teeth. As a rule tolerance for an hour or more presupposes favourable conditions. I have several times introduced the capsule after a morphine-scopolamine injection, the head being lightly supported during the seance, and found the patient able to bear it an hour to an hour and a half—a much shorter time than is given in gynæcology. The larynx reacted markedly during the first few days after the application especially if carcinoma were present and œdema sometimes appeared. It is well to avoid in the larynx a longer seance than an hour and a half.

A definite effect showed itself in each case. The carcinoma became smaller, but no cure resulted. The growth recurred and the gland metastases were unaffected. Carcinomatous glands should always be removed as they are uninfluenced by meso-thorium. It appears to me that laryngeal cancer, even flat-celled epithelioma, is not nearly so hopeful as carcinoma of the uterus.

Kahler has used the suspension hook *before* external operation (laryngo-fissure or total extirpation) and has infiltrated the parts in the hypopharynx with cocaine and adrenaline. He claims it lessens hæmorrhage.

New Growths and Foreign Bodies in the Hypopharynx.

The hypopharynx is widened by the lifting up of the larynx and can be more easily dilated with a suitable instrument. Seiffert has suggested a special form of forceps. Impacted foreign bodies such as dentures can be extracted without difficulty. Œsophago-scopy is not materially facilitated by suspension. Seiffert records a case of removal of a lipoma from the hypopharynx.

Taking it all in all, we have in suspension laryngoscopy a method which renders excellent service under definite conditions and enlarges still further the limits of our diagnostic and therapeutic knowledge. May it in your hands accomplish still more !

ADLARD AND SON, IMPR., LONDON AND DORKING.