of the urethra through the orifice in the anterior layer of the perineal fascia to twenty-seven or twenty-six millimetres usually check and sometimes stop the passage of a bullet bougie, and pain is felt by the patient. But it is seldom, if ever, necessary to pass the triangular ligament to discover unyielding parts of the urethra. Old well-marked strictures do invade the membranous part, it is true; but such have so greatly altered the form of the urethra in front as well as behind the perineal fascia that their detection is easy, and the bullet sound is not needed to discover such indurations." Three sizes of these flexible bullet sounds are generally made, corresponding to about Nos. 8, 12, and 14 or 15 English catheters, or 17, 22, and 25 or 26 French catheters. There are several advantages to be gained from the use of the bougies à boule, which, as Mr. Teevan was constantly insisting, must be distinguished from the bougies olivaires. By their aid you can detect slight and commencing strictures which would be overlooked by the mere use of ordinary flexible or gum-elastic or silver catheters or sounds. If one of these catheters or sounds passes a stricture on entrance without detection, it will pass it on its exit; but a bougie à boule of proper size, if it passes the stricture on entrance, will detect it on withdrawal, for the shoulder catches against the narrowed part owing to the contraction of the urethra behind the bulb of the instrument. A second advantage of the bullet sounds is that you can ascertain the number and exact position of the strictures present. I have used them for the last ten years, and by their means have become acquainted with a fact which I should never have ascertained by the use of tapering or cylindrical sounds or catheters, and that is that urethral stricture is very often multiple. There are generally two, three, and sometimes four strictures in an affected urethra. As these strictures are of different degrees of severity, it is quite easy to overlook all but the worst contraction. There may be a contracted meatus, a narrowing in the glandular portion, a stricture two or three inches down, and a fourth, and perhaps the worst, at or near the bulb. If the less conspicuous narrowings are overlooked, the patient does not derive the full benefit from treatment, and is more likely to relapse. Thirdly, the bougie à boule is most useful in discovering congested patches in the urethra which will become the site of stricture, and whose presence is the cause of a gleet discharge after local excitement now well recognised as indicative of commencing stricture. The flexible bullet sounds should be made of all sizes on the French scale like Otis's metal bulbs, and I regard them and the Otis urethrometer or expanding bulb as most valuable for the measurement and discovery of pathological narrowing of the urethral canal. On this point, therefore, I cannot agree with the sweeping condemnation passed upon them by Sir Henry Thompson in his excellent Clinical Lectures on Diseases of the Urinary Organs. After advocating for diagnosis the employment of a No. 10 or 11 flexible English gum-elastic bougie slightly curved towards the point with a blunt end (since a tapering point of course will not mark distinctly the site of the stricture), he shows that a stricture will be detected by the bougie "being grasped somewhat as it is withdrawn." He then passes this judgment on the bougie à boule. "Now, with the common exploring instrument, which is formed of a long small flexible bougie, terminated by a bulb of considerable size, nothing is more easy, especially with an unpractised hand, to deceive oneself with respect to the existence of stricture. If not drawn out accurately in the axis of the passage you may feel a check, and readily find what you believe to be a stricture in the most healthy urethra. And that is precisely what I am so anxious to guard you against, for in the hands of designing persons these instruments may be turned to most unworthy purpose. For men outside the ranks of our profession, or holding a questionable position on its outskirts, these instruments are the very things. That is an additional reason why we should be careful not to encourage their unnecessary use. I have for twenty years past used small bulbous instruments in metal for the diagnosis of narrow and confirmed stricture on which it is desirable to operate, but for slight stricture never; and I have protested against their use on the two grounds already named: first, that for such the instrument inflicts needless pain; secondly, that it is liable to deceive a young operator not too adroit or familiar with its use." Neither can I agree even with Mr. Harrison, who thinks that the best instrument for exploration is "the plain bougie, with the end slightly rounded (not bulbous) to facilitate its introduction. If a

surgeon cannot by this obtain all the information he requires about the urethra, I am sure," he says, "he will not be assisted by any of the bulb or olive-headed instruments which are vaunted for this purpose. It is a matter of touch and of handling. What is wanted is the *tactus eruditus*, the acquisition of which requires as much practice as is needed to detect fluctuation. To the unpractised hand the whole length of the urethra is a stricture, which no form of instrument renders otherwise." Most unquestionably a practised hand will detect by an educated touch far more than a beginner even with an ordinary sound or catheter; but the practised hand will discover more with a suitable than an unsuitable instrument. And, as regards the bullet sounds, I cannot do better than quote the teaching of a former colleague of Sir Henry Thompson's, who is on the Court of Examiners at the College of Surgeons, and will not therefore, I presume, be regarded either as a designing person, or as outside the ranks of the profession, or holding a questionable position on its outskirts. In November, 1879, in some excellent lectures on stricture of the urethra, published in the *British Medical Journal*, Mr. Berkeley Hill took a view of the comparative diagnostic value of the bougie à boule diametrically opposed to that of Sir Henry Thompson. He then said "the size and shape of the instruments employed in the examination of the urethra are of great importance; indeed, unless you provide yourself with suitable instruments, you will not gain any precise knowledge of the condition of the urethra you are asked to treat, and will probably bungle in your treatment. Bullet sounds with slender stems (*sondes à boule*), some flexible, some rigid, are requisite in addition to the urethrometer. In searching for stricture I discard instruments with tapering points or of equal calibre throughout—the ordinary so-called French and English bougies or sounds; they are deceptive in several ways. For example, an instrument of which the stem and point are of equal thickness is gripped the whole time it is passing through the stricture, and the presence of other non-expanding points behind the first, notified by the sound, is not perceptible, unless indeed they be narrower than the first, when they stop the further progress of the instrument." With these remarks I fully coincide, and can only add that the fact that a valuable and necessary instrument may be abused is no argument against its legitimate use. If it were, the female speculum, the laryngoscope, and even the clinical thermometer would have to be discarded. As to the disagreement of surgeons in their estimates of surgical procedures and instruments you need not be surprised or troubled, for we constantly find that even within a brief space of time a surgeon will disagree with himself.

THE INFREQUENCY OF CANCER AMONG FEMALES IN THE ENGLISH LAKE DISTRICT.

BY ALFRED HAVILAND, M.R.C.S.,

LATE LECTURER ON THE GEOGRAPHICAL DISTRIBUTION OF DISEASE AT ST. THOMAS'S HOSPITAL, ETC.

AT a time of the year when the facilities for enjoying one of the most beautiful and interesting districts in England are yet in full career, the readers of THE LANCET may not think inopportune the following notes, made during a recent visit to Kendal, with the view of supplementing my remarks published last year in that journal on some of the causes coincident with the low mortality from cancer among females in the Lake District.¹ As the copies of THE LANCET containing the articles referred to may not be at hand, it will perhaps be well to give a brief summary of the facts connected with the distribution of this disease in Great Britain.

In 1868, in a paper read before the Medical Society of London, illustrated by a large coloured map, I first demonstrated that cancer among females had a well-defined geographical distribution throughout England and Wales, and that when the cancer map was studied in connexion with a geological map of this country the following disease

¹ The Geographical Distribution of Cancerous Disease in the British Isles. THE LANCET, vol. i. 1888, pp. 314, 365, 412, and 465.

and geological facts were coincident:—(1) That among the 630 registration districts into which England and Wales are divided, those low-lying districts which were either traversed by, or were contiguous to, fully formed rivers that seasonally flooded the country through which they flow were characterised by the *highest* mortality from this cause of death. (2) That, on the other hand, those districts which had the *lowest* mortality had a high average level, were situated on or near the water-partings where rivers derived their sources, and where the rock-base under their soils consisted of the older geological formations, such as the Cambrian, Silurian, old red sandstone, and mountain limestone, or of the more recent chalk, and where floods were either impossible or only temporary.

Such were the simple facts which I announced nearly twenty-one years ago, based upon the deaths that took place from cancer among females during the ten years 1851–60. Since then I have added the facts which the succeeding ten years (1861–70) have afforded me, gathered from the late lamented Dr. William Farr's second decennial supplement to the late Major Graham's (Registrar-General) thirty-fifth annual report. Owing, however, to the supplement for the last decennial period (1871–80) being defective, the present Registrar-General having incontinently and confusedly mixed up the male with the female deaths, further addition to my twenty years' facts is impossible until this report is amended and published in the form established by Dr. Farr. This defective report is fully discussed in the articles in THE LANCET already mentioned, to which I must refer the reader, only adding that the defects in this perfunctory report have been brought to the notice of the Government, and it is hoped that before long the work will be placed in competent hands, and reissued in accordance with Dr. Farr's models.

The facts of the second decennial period (1861–70) confirming in every respect those which I announced in 1868, and have just briefly repeated, the question then arose, How did river floods affect the local climates of those districts wherein for twenty years cancer proved itself most deadly? In the first place, it was discovered that in some oft-flooded river valleys, such as that of the Thames, remarkable exceptions were to be found—namely, that in four of the riparial districts of this river a comparatively low mortality from cancer among females obtained; two of these districts, Wycombe and Cookham, were above London, and two below, Orsett and Dartford. These districts were found in pairs, one lying on the right and the other on the left bank of the Thames, and separated only by the river. Coincident with the low mortality of these two pairs of districts was the fact that at both these points in the river's course chalk came to the surface and formed the rock base of the soil of these four riparial districts, whilst underlying the gravel and alluvium of all the high-mortality riparial districts were the Oxford clay, the Kimmeridge clay, Gault clay, plastic clay, and London clay, all retentive strata, and calculated, as will be presently seen, to intensify the evils of floods and their sequels—dead vegetation and vegetable decomposition,—resulting in the formation of numerous gases and acids, which not only render the soil sour, but injuriously affect the atmosphere that lies above it, and therefore the local climate of the district where floods occur, and far beyond their high-water mark. It is a well-known fact that by the retention of the acid products of vegetable decomposition consequent on river floods the superficial soil is rendered sour, and the subsequent herbage rank and deleterious, especially to young cattle and sheep. It is also well known that the grass which covers the soil overlying chalk or limestone is sweet, even when these rocks are covered to a considerable depth by sands and gravels, whether of post-glacial or of recent fluvial origin; whereas, when the chalk or limestone underlies a considerable deposit of boulder clay or recent alluvial clay, their neutralising powers are barred from taking effect by the intervening obstructing layer of retentive soil.

It has been shown in my work on the Geographical Distribution of Heart Disease,² and in my more recent lecture on the Distribution of the Wheat-yield in Great Britain,³ how the configuration of the country influences the free access of the prevailing winds; how when access from the sea is aided by the direction of the trend of the valley systems coinciding with that of the atmospheric currents; and how

it is obstructed when the river valleys are at right angles to them, in the latter case causing them to blow over instead of up through them, as in the former system. In England and Wales the prevailing winds are either south-westerly or north-easterly. In the case of free and unobstructed access, the valleys are swept clean of all residual air, and are thus purged of atmospheres contaminated either by emanations from the soil or human habitations. On the other hand, when free access is barred, and the winds are forced over the water-partings, all that is deleterious in the atmospheres in the valleys below is rendered still more deleterious by accumulation; hence it is that in such pent-up stuffy valleys the local climates not only engender diseases, but intensify those that are imported into them. Two thousand five hundred years ago Hippocrates pointed out the different effects on health experienced in “stuffy hollows and in fresh uplands.” Knowing these facts, it will not be difficult to understand why, in the case of cancer among females, we find those districts where the soil favours the intensification of the evils of floods varying in their death-rates from this cause, according to the configuration of the land in which they lie; in fact, why the more pent-up inland districts should have a higher death-rate, as a rule, than the more open ones, exposed to the free access of the winds and their air-flushings and oxidising properties. With this introduction I will now give a brief account of my late investigations in the English lake district.

At the International Geological Congress held in London in September, 1888, I pointed out to the members the fact above narrated with regard to the coincidence of low mortality in the Thames valley with out-crops of chalk in the districts where it occurred. That the vegetable acids, the result of vegetable decomposition after floods, were neutralised by the chalk I have not the slightest doubt; neither had those around me who were at the time looking across the Thames at the chalk at Purfleet, in the Orsett district, whilst standing on the chalk of the Dartford district, and admiring the chalk flowers that bloomed around us. The soft nature of the rock precluded the permanence of the effects of acid erosion on its surface. Moreover, the permeability of chalk allowed the rain to enter its structure rather than run over it laden with the acids, and etching channels as it flowed. In the harder limestone, however, the acids leave permanent records behind of their having been neutralised by the carbonate of lime.

Whilst visiting Kendal this year, with the view of comparing the limestone of the southern Lake District with that in the Isle of Man, and of studying the relation of these rocks to the fully-formed rivers of this district, through the courtesy of the honorary secretary of the Westmorland Natural History Society, Mr. Severs, I made part of an excursion to the limestone escarpment of Lyth Fell, where are to be seen on a gigantic scale the records of vegetable decomposition and vegetable acid etching of the tilted limestone slabs, on which the dead leaves of the shrubs and trees of the wood had fallen and decayed. The limestone dips at an angle varying from 5° to 20° towards the east, and forms a bold escarpment looking towards the west. The joints are all enlarged by “weathering” and the erosion of the vegetable acids, so that they are often dangerously deep, and remind one of the Chasms in the Isle of Man; the surfaces of the tilted slabs are carved into long, deep, and tortuous watercourses. The upper margins of the slabs are entire, but the lower are eaten through, forming, in fact, the outlets or mouths of the strangely serpentine channels. In each channel lies dead and dying vegetable matter, creating fresh acids for the next rain to wash out of its mass and thus enlarge and deepen the channel in which the mass rests, which in many places completely covers the stone. This “weathering,” as it is termed, has been ascribed to rain alone, which, by means of the carbonic acid it contains, is said to dissolve the carbonate of lime by converting it into the soluble bicarbonate; but anyone who at a glance can see scores of acres of tilted slabs all sculptured into serpentine channels as I have described, and these channels filled with decaying acid vegetation, will not find it difficult to understand that the rain finds powerful allies in the sour masses on which it falls in its work of erosion, nor will he hesitate to accept the evidence before him of the power of neutralising the acid products of vegetable decomposition in carbonate of lime in the form either of limestone or of chalk. These limestones have been described

² The Geographical Distribution of Heart Disease, Cancer, and Phthisis. Folio. Smith, Elder, and Co., 1875.

³ “The Farmer,” 1886; “Bell's Weekly Messenger,” *ib.*; and “The Mark Lane Express,” *ib.*

by Mr. A. Strahan in his memoir on the Geology around Kendal. "In the Kendal area," he says, "they dip to the east, and present an unusually precipitous and continuous face to the west; on the east they are cut off by a fault. This limestone forms the most northerly projection from a much-faulted range of carboniferous rocks, which fringes the Lake District on its south side." In fact, at and below Kendal as far as Duddon Mouth they underlie the superficial and permeable sands and gravels traversed by all the rivers that fall into Morecambe Bay. Again, on looking at a geological map of this part of England, it will be found that these limestone rocks are continued on the north-east of Kendal at Orton, whence, as the same author remarks, they form part of a prolonged escarpment of these rocks, which fringes the Lake District on its north and east sides. These limestones form a crescentic belt around the Lake District, which can be traced from Duddon Mouth through Kendal, and through out-liers at Skelsmergh and Gray Rigg to Orton, whence it continues in an unbroken line onward by the north to the Whitehaven district. I must, however, remind the reader that whilst in the south, below Kendal, this limestone crescent underlies those parts of the rivers where floods may most frequently occur, and therefore where its influence would be most required, along the remainder of its course by the east and north to Whitehaven it crosses the higher parts of the many rivers which radiate from the central water-parting of the Lake District, consequently where floods are either impossible or rare. These facts should be remembered when the statistics of cancer among females are discussed. The distribution throughout Great Britain of phthisis being so markedly the reverse of that of cancer, it is always instructive to study the two causes of deaths together whenever possible.

The English Lake District.—The seven registration districts that constitute the English Lake District belong to three different counties: (1) Cumberland, including Penrith, which may be said to share Ulleswater with Westmoreland; Cockermouth, in which are Thirlmere, Derwentwater, and Bassenthwaite; Buttermere, Crummock, and Lowes Waters; Whitehaven with Ennerdale, and Bootle with Wastwater. Two belong to (2) Westmoreland West Ward, sharing Ulleswater with Penrith, and containing also Haweswater and Brotherswater; and Kendal, which includes Kentmere, Windermere, and Grasmere. One district belongs (3) to Lancashire—Ulverston,—which includes Coniston-water, and may be said to share Windermere with Kendal. All these lakes average a level of 326 feet above the Ordnance datum.

The Distribution of Cancer and Phthisis in the Lake District compared.—In 1868, in a paper read before the Medical Society of London, I first pointed out the significant fact that throughout England and Wales the distribution of these two diseases greatly differed from each other; so much so, in fact, that the *high* mortality districts in one map were, as a rule, represented by *low* mortality in the other, and that when low mortality from these two causes of death were coincident, the districts were found to be the healthiest, as indicated by their death-rates from "all causes." In 1887, in a lecture delivered at the Edinburgh School of Medicine, embodying the results of recent investigations throughout Scotland, I showed that these diseases had a similar distribution in North Britain. With regard to the Lake District, I have shown that throughout the twenty years 1851–1870 it had a low mortality from cancer among females as the rule. In Great Britain the districts having the highest death-rates from phthisis are invariably those that are most exposed to the full force of prevailing winds, which I have explained in my work on "The Distribution of Heart Disease, Cancer, and Phthisis," and again in the one on "Scarborough." We shall therefore be prepared to find that the most exposed lake districts have a higher death-rate from this cause than the more protected ones. Thus the exposed lake districts are Cockermouth (28·53), Whitehaven (26·54), Bootle (35·88), Ulverston (28·61); the mean annual death-rate from phthisis to every 10,000 females living being 28·61. On the other hand, the sheltered lake districts have a less though still high death-rate: thus, Penrith (26·71), West Ward (25·95), Kendal (28·07), mean, 26·91. When, however, we take the cancer death-rates a great difference is seen. Taking the districts in the same order, the annual death-rates from cancer among females are as follows:—The coastal: Cockermouth (4·58), Whitehaven (2·93), Bootle (3·23), Ulverston (2·88),

mean 3·40. Inland: Penrith (5·11), West Ward (4·67), Kendal (3·12), mean 4·30. If we take the mean cancer and phthisis death-rates among females for the seven lake districts during the twenty years 1851–70, we find the following—cancer 3·80, and phthisis 28·38, the latter very high and the former very low, but strictly in accordance with the rule stated above. Again the coastal lake districts have a mean death-rate for cancer of 3·40, and phthisis 29·49, the former below and the latter above the lake standard. Whilst in the inland districts the reverse obtains: the cancer death-rate, although low when compared with that of England and Wales for the same period (4·78), is higher than the local standard (3·80), amounting as it does to 4·30. This, too, is in perfect harmony with what I have taught prevails throughout Great Britain. Of the inland districts Kendal (3·12) was the lowest cancer death-rate, and this agrees with its double character, for, independently of its geological features, which are all in favour of a low cancer death-rate, an important section of its population (55 per cent.) is exposed to the full influence of the prevailing winds from Morecambe Bay, which thoroughly air-flush the lower valley of the Ken and thus keep its local climate free from stagnation and the consequent accumulation of injurious emanations from the soil. Coincident with this free exposure of the lower valley to the full force of the winds from the sea, we find that, whilst it has the lowest death-rate from cancer, it has the highest from phthisis amongst the inland lake districts.

The Increase of Cancer.—In 1886 I read a paper before the Collective Investigation Committee appointed in accordance with the suggestion of the Berlin Medical Congress with the view of reporting upon my works on the distribution of disease, in which I drew attention to the fact that, whilst undoubtedly cancer was increasing and phthisis decreasing in this country, the latter disease had been found to be increasing in some districts where cancer was actually decreasing. In the Lake District cancer has increased very little indeed among females. In the north Lake District it has actually decreased, the death-rate in 1851–1860 being 4·15, whilst in 1861–70 it only amounted to 3·99. In the south Lake District in 1851–60 it was 2·75, but in 1861–70 it rose to 3·63; whilst for the whole of the Lake District the rates were 3·52 for 1851–60, and 3·82 for 1861–70. During the same periods the districts of Cumberland and Westmoreland outside the lakes had a mean death-rate in 1851–60 of 3·63, whilst in 1861–70 it amounted to 5·58. It may therefore be said that, among the female population living within the influence of the English lakes, cancer during the twenty years 1851–70 pursued a steady low course, whilst generally throughout England and Wales it had been increasing in its ravages, and that this increase was evident even in the districts immediately outside the lakes.

There is yet a more certain and useful test of the accuracy of the above statement—namely, the elimination from the mean female populations and the deaths of cancer occurring among them of all women above thirty-five years of age, and of the deaths that took place at and above that age during the twenty years 1851–1870. During those twenty years the mean female population in the Lake District amounted "at all ages" to 98,880, amongst whom 729 died of cancer. At the same time there was a mean population of women living, amounting to 30,757, at and above thirty-five years of age, of whom 693 fell victims to cancer, so that over 95 per cent. (96·06) of the deaths from this cause among females occurred at and above thirty-five years of age.

Now, if we take the annual death-rate from cancer to every 10,000 women living at the above age-period, we shall find that, whilst in England and Wales it amounted to 14·31, in the Lake District it reached only 11·50, equal to an annual saving of 2·81 to every 10,000, which, in round numbers, among the 30,000 women, would equal a saving of 170 lives during the twenty years. In other words, the death-rate in the Lake District being 11·50 instead of 14·31, nearly 20 per cent. (19·63) of valuable lives are saved from succumbing to this terrible cause of death.

When it is proved that a fell disease like cancer claims victims in every district of South and every county of North Britain at an increasing rate, and whilst the natural history of such a long-torturing cause of death is still quite unknown, it is a gain at least to discover where certain conditions of soil and local climate exist that are proved to be coincident from one end of this country to the other, with its least power to torture and destroy; it is satisfactory also

to know that the conditions favourable to the lowest form of mortality from cancer are well defined, of certain character, and admit of a simple description and an explanation which appeals to the understanding and common sense of all. To know where those should go or be sent who are threatened with this disease, with the best chance of arresting its development, is a gain in preventive medicine; and it is a relief to know that the most beautiful part of our country—the English lakes—not only possess the conditions of soil and climate found to be the least conducive to the growth of this disease, but that these conditions have during the twenty years taken been effective in keeping it at bay, whilst in other parts, and closely around, cancer has been gaining ground.

I first studied the physical configuration of the Lake District in relation to local climate and disease distribution from Windermere, where every facility for investigating the northern Lake District is at hand during the season. During my last investigation I selected Kendal as the centre, and found it an admirable station, the neighbourhood being full of interest for the naturalist, the archæologist, the geologist, and the medical geographer. The beautiful drive from Kendal over the Windermere Ferry at Bowness, by Esthwaite, Tarn Hawes, through Hawkshead to Coniston-water, and back by Ambleside, Windermere, and Staveley, will give the student a better idea how local climates are formed, and how much they are dependent upon the geological structure and physical configuration of the district, than any written description, especially if he make on his way graphic notes in his sketch-book. From Kendal, too, the limestone country around the rivers which flow into Morecambe Bay can well be studied, as well as the superficial drift deposits, forming *drumlins* of sand and gravel over 300 feet high sometimes, as the Castle Hill. The "Concangium" at Water Crook, south of the town, is highly interesting to the visitor, and has much to tell the medical geographer. This old Roman Castrum, the flocks of gulls that fly around and feed in the river around it, and even the stormy petrels found sometimes in the streets of Kendal, are all regarded with interest by those who study local climates with the view of tracing their connexion with local flora and local diseases.

NEW ANTISEPTIC ARTIFICIAL TYMPANIC MEMBRANE.

By JOHN WARD COUSINS, M.D. LOND., F.R.C.S.,
SENIOR SURGEON TO THE ROYAL PORTSMOUTH HOSPITAL AND TO THE
PORTSMOUTH AND SOUTH HANTS EYE AND EAR INFIRMARY.

THE essential qualities of a good artificial drumhead are numerous. 1. It must, first of all, decidedly improve the hearing power. 2. It must be so constructed that it can be easily placed in the right position and easily removed; it ought also to be especially adapted for self-application. 3. It must be extremely light and delicate in structure, so that it causes no sensation or irritation in the meatus by its presence. 4. The artificial drumhead ought also to be an efficient protector to the injured organ, and a screen for maintaining the moisture of the exposed tympanic cavity. 5. It should be capable of fitting the varying capacity of the external meatus, so that, when once placed in position, it is not liable to displacement. 6. It ought to be a convenient vehicle for the application of local astringent and deodorising remedies. 7. The contrivance should be obtainable at a trifling cost, so that a new artificial membrane may be used as often as necessary.

The new membrane which I desire to submit to the criticism of my professional brethren is represented in Fig. 1. In shape it is exactly like a hat with a very high and tapering crown and a broad and flat brim, having a short ribbon attached to the edge. It is just firm enough in substance to retain its shape in the ear, and yet the material is so soft and flexible that it causes no sensation by its presence. It is stained a delicate flesh colour, and is made in several sizes to suit the varying capacity of the external meatus. When in position the crown rests near the tympanic membrane, the brim upon the meatal wall, and the little ribbon or handle behind the tragus. The method of manufacture has been worked out by a series of experi-

ments. The material is composed of compressed cotton fibre, swollen by prolonged immersion, and saturated in an antiseptic oil and ether. The soft material is then firmly compressed in a little machine that I have designed for the purpose, and afterwards dried by artificial heat.

One marked feature of the new antiseptic membrane is its extreme lightness. The weight varies a little according

FIG. 1.

to the size, and this has a range from one-sixth to one-quarter of a grain. I have often introduced it without the patient being aware that anything had been put into the meatus.

Another special quality consists in the facility with which it can be introduced and removed by the patient himself. The little instrument for the self-application of the artificial membrane is depicted in Fig. 2. The probe end is

FIG. 2.

inserted into the crown of my little hat, and in this way it can be accurately placed in the meatus, and then detached from the instrument by the aid of the sliding collar. Patients very soon get into the way of adjusting it and slipping it into position, with just the right amount of pressure for securing the best result. The forceps is intended to be used for the removal of the artificial membrane, and in doing this patients are guided by their tactile sensibility. Traction is made upon the handle, which ought always to be easily found resting just behind the tragus.

It is a matter of great practical importance in every case that the artificial membrane should be selected to suit the shape and capacity of the external ear. It is my practice to regulate the height of the crown by the sensations of the patient and the breadth of the brim by the size of the meatus. It must not fit too tightly, but simply rest in contact with the meatal wall, so that after it has been put into the right position it does not get easily displaced. It is not necessary to place the crown upon the perforation or in contact with the remnants of the tympanic membrane. The surgeon cannot select the point of contact by any internal scrutiny of the organ; but, in every case he must be guided by the sensations of the patient and the improvement produced in the hearing power.

The artificial drumhead may be regarded also as an ear protector and a local antiseptic remedy. I have recently made some impregnated with the oils of eucalyptus globulus and pumiline pine in combination with other aromatic substances, and their agreeable fragrance renders them extremely grateful to some patients, especially those who have suffered from offensive discharge. Other patients with perforation of the tympanic membrane, but without serious deafness, have used them as ear protectors with great comfort. In such cases the artificial membrane forms a screen between the middle ear and the external meatus, and acts as an efficient shield during rough and cold weather.

With reference to the length of time an artificial membrane can be retained in the ear, I recommend a fresh one to be introduced every day, and of course this is absolutely necessary in all cases of otorrhoea. It should be taken out