

for about one-third of its length with calcareous material. A case has also come under the writer's observation in which a gold tube, after being worn for some time, passed through the alveolar process of the superior maxillary bone, and was finally removed through the socket of one of the incisor teeth which had been extracted some time before.

According to Desmarres, J. L. Petit was the first to attempt the cure of lachrymal stricture by the use of a contrivance intended to be worn temporarily in the nasal duct. His plan was to make an incision into the lachrymal sac, and then to pass a grooved director through the duct, and, by the aid of the latter, to introduce a bougie, which was changed every day. Desmarres himself practised essentially this same method of treatment. Anel attempted to overcome the obstruction of the duct by forcing water into the lachrymal sac, through the canaliculus, by means of the syringe which bears his name. He also endeavored to dilate the strictures by means of slender probes, which he introduced through the canaliculus; but he admitted that the latter method was applicable only to cases of slight obstruction. Benjamin Travers, who was very sceptical as to the utility of the gold cannula which Dupuytren used so extensively, also made use of probes, which he passed through the nasal duct by way of the punctum and canaliculus. His probes were larger than those of Anel, and his results, therefore, were more satisfactory. Dr. Isaac Hays, in this country, early adopted this plan of treatment, and modified and improved the probes of Travers. The probes which he used varied in size from 0.8 to 1.5 mm. in diameter. Ware suggested the use of nail-headed styles, which were to be worn temporarily, with the expectation of curing the stricture. They were introduced through an incision in the lachrymal sac, the round flat head of the style being permitted to remain outside the opening. Beer employed catgut cords of different sizes, which he introduced in a similar way and passed slowly through the duct, a fresh portion of the cord (which was kept coiled upon the head) being drawn into the duct each day, while the part which had been used was pulled out through the nose and cut off. Méjean used meshes of silk threads, which he introduced into the duct through the canaliculus by means of a slender needle-like probe. A more novel idea was that of Blizard, who filled the lachrymal sac with quicksilver, expecting the obstruction of the duct to be overcome by the weight of the small globule of mercury which the sac is capable of holding. Probes intended to be passed by way of the inferior orifice of the duct, through the nose, were also devised, and great advantages claimed for them, but they were not received with favor.

Coming now to a more recent period, we find a great advance made over all previous methods of dealing with lachrymal obstructions in the operation, devised by Bowman, of slitting the canaliculus, to facilitate the passage of the probes which bear his name. This procedure not only enabled the surgeon to make use of larger probes than had been employed previously, but it facilitated the application of medicinal agents to the lachrymal passages. Still, however, the results obtained by those who followed Bowman's method were far from satisfactory, and relapses after the discontinuance of the treatment were discouragingly frequent. In consequence of this, various modifications of his method were proposed. Mr. Pridgin Teale, of Leeds, and Mr. Critchett, employed probes with bulbous extremities. Dr. E. Williams, of Cincinnati, used similar probes, but with the bulbous portion considerably larger, the largest of his probes at the bulbous extremity having a diameter of $3\frac{1}{4}$ mm. Dr. H. D. Noyes, of New York, following the example of Dr. E. Williams, insisted upon the necessity of more thorough dilatation of the duct than could be accomplished by means of Bowman's probes, and probably as early as 1870 (as he informed the writer) made use of short, hard-rubber probes which in their higher numbers had a maximum diameter of 4 mm. He also devised a gouge and a bulbous probe of unusual length, "having a

slight bend at the bulb," for the especial purpose of dealing with the very firm strictures which are occasionally encountered at the lower extremity of the duct.¹ Dr. H. W. Williams, of Boston, employed a bulb-pointed, flexible probe, which he claimed could be passed with greater ease through the sinuosities of the contracted duct, while Mr. Crouper, of London, used bougies of laminaria digitata. Dr. Stilling, of Cassel, made a more decided departure, by recommending free incision of the strictures by means of a knife which he devised for the purpose, and which he introduced into the duct through the divided canaliculus.* Dr. Warlont, who followed Stilling's example, obtained good results, but others were not so fortunate, and this method has never come into general favor. The use of styles of various patterns was also combined with the slitting of the canaliculus. Dr. E. Williams, of Cincinnati, reported favorable results from the use of silver styles, while Dr. John Green, of St. Louis, employed styles made of lead, because they could be easily fashioned to suit the peculiarities of each case, and because they adapted themselves to any irregularities in the shape or curvature of the duct. Instead of the nail-head of the older form of style, all of these, as they were introduced through the slit canaliculus, had curved necks, which were bent over the margin of the lid. Finally, in severe cases which were not relieved by any of these methods of treatment, extirpation of the lachrymal sac (Berlin), or its destruction by means of nitrate of silver (von Graefe), nitric acid (Agnew), chloride of zinc paste (Pagenstecher), or the galvano-cautery, was recommended. Removal of the lachrymal gland was also practised, under similar circumstances, by Mr. Zachariah Laurence and others.

In 1877 the writer, having become convinced that success in the treatment of lachrymal strictures was to be found in the use of probes large enough to restore fully the normal calibre of the contracted duct and to obliterate every trace of stricture, determined to ascertain what is the usual size of the healthy nasal duct, and how large a probe might, as a rule, be passed through it. With this end in view, he had a number of large probes made of copper wire, varying in diameter from $\frac{3}{8}$ to 7 mm., and with these he gauged the size of the bony canal of the nasal duct in all the skulls—thirty-nine in number—which were to be found in the Anatomical Museum of the University of Maryland, the method followed being simply to ascertain how large a probe could be passed, without violence, through each duct. In a similar manner a number of canals, with their membranous lining intact, were measured upon the dead subject. The result of these measurements was to make plain, what the writer had been almost convinced of before, that there was a ridiculous contrast between the size of the nasal duct and the size of the lachrymal probes which were commonly employed at that time. For example, while the largest of the six probes originally recommended by Bowman had a diameter of scarcely 1.3 mm., it was found that the smallest ducts in the thirty-seven adult skulls examined (there were only six as small as this) admitted a probe 3 mm. in diameter, and that twenty-three of the seventy ducts which these skulls possessed in a sufficiently perfect condition to be measured admitted probes varying from $4\frac{1}{4}$ to 7 mm. in diameter, four of them permitting a probe of $5\frac{1}{4}$ mm. to be passed. The measurements made upon the cadaver were not less striking. Of the twelve ducts examined, one, which seemed to be pathologically contracted, would admit a probe of only $2\frac{1}{4}$ mm., but the next smallest admitted one of $3\frac{1}{4}$ mm., while through three of them a probe $5\frac{1}{4}$ mm. in diameter was passed without difficulty.† It is true

* It has recently come to the writer's knowledge that, as early as 1846, Dr. Nathan R. Smith, of Baltimore, practised division of lachrymal strictures (probably through an incision made directly into the lachrymal sac), and that he contrived a probe-pointed knife for this purpose. (See Norris and Oliver's "System of Diseases of the Eye," vol. iii., p. 161.)

† The inadequate size of Bowman's probes is made more manifest if, instead of comparing the diameter of his No. 6 with the diameter of the larger probes used by the writer in his investigation, the ratio of

that Bowman's No. 6 was not the largest probe in general use at this time; but few operators had ventured to go beyond a diameter of 2 mm.

The writer learned afterward that Dr. H. D. Noyes had previously made an investigation of similar character, and as the result of his measurements had reached the same conclusion which the writer did as to the inadequate size of Bowman's probes and the necessity for employing very much larger ones.*

In consequence of the knowledge gained by his investigation of the normal calibre of the nasal duct, the writer had a series of probes made, comprising sixteen different sizes, the smaller numbers, from 1 to 8, being made of coin-silver; the larger ones, from 9 to 16, of pure silver; No. 1, the smallest, having a diameter of 0.25 mm.; No. 16, the largest, a diameter of 4 mm., with a difference of 0.25 mm. in the diameter of each succeeding number. Subsequently he had the sizes from 7 to 16 made of aluminum because of its lightness and smoothness; he has also had them made of copper, nickel-plated, and has found these very satisfactory, one advantage being that they stand boiling much better than do those made of aluminum. The ends of these probes were fashioned with especial care, being made more conical and pointed than those of Bowman; for it was evident that the larger sizes could not be passed into the sac through the slit canaliculus, if their ends were as square and blunt as they had previously been made. The accompanying illustration, which represents the actual size of No. 16, the largest of the series, shows correctly the shape of the ends and also the curve which has been found most convenient.‡ The practicability of using the largest of these probes in the treatment of lachrymal strictures was soon demonstrated, and it was not long before the advantage of doing so became manifest. Although satisfied that they were not out of proportion to the actual size of the

Fig. 3099.—Theobald's Probe for Dilating Strictures of the Lachrymal Duct. (Actual size.)

duct, the writer had at first some misgivings as to the practicability of introducing them into the sac through

the calibre, or thickness of the former to that of the latter, be stated. For example, if we credit Bowman's No. 6 with a diameter of 1.5 mm., which is larger than it is usually made, we find that a probe 4 mm. in diameter is actually more than seven times as large; while one of 5.25 mm. (which is the size the writer passed through several ducts upon the cadaver) is twelve and a quarter times as large, and one of 7 mm. (the largest introduced into the skulls) is nearly twenty-two times as large.

* Dr. Noyes measured the ducts in five skulls, in some of which sections had been made, so that the size of the lower as well as the upper extremity of the duct could be ascertained. They were all found to be more or less decidedly oval in cross section, with the long axis from before backward, and he measured the long and short axis of each. At the upper end they varied in size from $8 \times 6\frac{1}{4}$ mm. to 5×4 mm.; at the lower end, from $7\frac{3}{4} \times 5$ mm. to 8×4 mm. See his paper, already referred to, in the Transactions of the New York State Medical Society for the year 1876. Compare also the measurements of the lachrymal duct made by Mr. Henry Power, and described in "Lectures upon Diseases of the Lachrymal Apparatus," published in the London Lancet, 1886, vol. ii.

‡ A description of these probes, with an account of the measurements of the nasal duct referred to above, was first published in the Transactions of the Medical and Chirurgial Faculty of Maryland for the year 1877. See also, "Archives of Ophthalmology," vol. vi., Transactions of the American Ophthalmological Society for the year 1879, and Transactions of the Eighth International Ophthalmological Congress, 1894.

the divided canaliculus; but he soon found that this was not attended with difficulty.

The writer's experience in the use of these probes now extends over many years, and he is to-day more than ever convinced that it is by such thorough and complete dilatation as they afford that permanent benefit is to be gained in the treatment of lachrymal obstructions. The complete obliteration of all constrictions and the restoration of the normal calibre of the duct are the results which we should aim to accomplish; and to secure this result it is essential that probes as large as those which the writer has recommended should be employed. When smaller ones, of 1.5 or 2 mm. diameter, are used, we merely open a small passageway through the constriction, instead of obliterating it completely, and, as might be expected, a reclosure of this narrow channel is the usual result of a discontinuance of the probing. The large probes, on the other hand, not only open a free passageway through the fibrous and bony obstructions, but, by the pressure which they exert, bring about their absorption, and in this way tend to restore the lining membrane of the duct to its normal state. This change in the condition of the walls of the duct can be detected during the introduction of the probe, and is a matter of frequent observation. The rough, grating sensation which is felt at first from the probe coming in contact with diseased bone gradually disappears, until, after a longer or shorter time, the probe glides smoothly through the duct, giving a sensation not unlike that which attends the introduction of a sound into the healthy urethra.

The writer has never contended that the largest probe of his series can be, or should be, passed through every strictured duct; but his experience has convinced him that the cases in which it cannot be used with advantage are exceptional. The question is frequently asked, Does the use of such very large probes never occasion any mischief? In reply it may be said that the surgeon is less likely to do harm with them than with probes of small size, since the risk of making a false passage is much less. It is undoubtedly true that they frequently leave the previously strictured duct more pervious than the canal usually is in its normal condition; but this causes no inconvenience, beyond the fact that when the nose is blown air is apt to find its way through the duct to the corner of the eye. The impression held by some that the physiological action of the canaliculus and duct in carrying off the tears must be impaired by the use of such large probes, experience has shown to be absolutely groundless. If necessary, it is permissible to use a considerable amount of force in gaining a passage through the duct, and the writer would not be surprised if sometimes he has not only broken through bony strictures, but has "rectified" the boundaries of some physiologically contracted canals. A fracture of these thin plates of bone is, however, a matter of little moment, and less timidity in dealing with these cases should be encouraged.

It will not be out of place, perhaps, to give here a brief description of the method which the writer usually follows in treating strictures of the nasal duct: A few drops of cocaine (4 to 100 solution) or holocaine (1 to 100 solution) are instilled into the inner canthus, and when this has produced its effect a fine probe (No. 1 or No. 2) is introduced into the lower canaliculus, to ascertain whether it is obstructed at any point; for it is not uncommon to find occlusion of the inner end of the canaliculus associated with stricture of the nasal duct; and if this be the case, it is better to make the discovery, and to relieve the obstruction before slitting the canaliculus, otherwise the beak of the knife will fail to enter the sac as it should, and the operation will be imperfectly accomplished. A straight, stiff, rather sharp-pointed probe (Fig. 3100) is the best instrument with which to force this stricture, should one be encountered. It should be passed along the canaliculus to the stricture, and, the lid being kept upon the stretch, should be forced through it with a boring movement. If this cannot be done, a sharp-pointed knife must be used to make an opening into the sac, either before or after the division of

the canaliculus, as the operator may prefer. If, however, no obstruction to the entrance of the small probe into the sac is encountered, Weber's probe-pointed knife is introduced, its blunt end carried well into the sac, and the canaliculus freely divided, care being exercised (as has been previously suggested) to incline its cutting edge somewhat toward the eye, so that the gutter made by the division of the canaliculus shall not present in an outward direction. In performing this operation, as well as in introducing probes into the nasal duct, the writer prefers to stand behind the patient, using his right hand for the right eye, and his left for the left eye. In this position the patient's head can be held firmly by the operator, which is an important consideration, while at the same time it is convenient for his manipulations. Although, formerly, the writer did not feel it incumbent upon him to sterilize the knives and probes used in dealing with lachrymal strictures, an occasional infection from a seemingly clean lachrymal probe has convinced him that only sterile instruments should be used. A brief immersion in boiling water has been found to be the most effective and convenient way of accomplishing the desired result.

The canaliculus having been divided, an attempt is next made to introduce a probe. It is not often practicable to pass into the sac, immediately after dividing the canaliculus, a larger probe than No. 5 of the writer's series, so this is the one usually introduced first; but if No. 6 or No. 7 can be gotten into the sac without difficulty, it is better to start with one of these, since the larger the probe the less the danger of getting out of the right track. It may happen that even No. 5 cannot be made to enter the sac, and then No. 4 or No. 3 must be tried. If, however, there is much difficulty in entering the sac, it is better to wait twenty-four or forty-eight hours before making further attempts, as the changes which take place during this time in the cut edges of the canaliculus frequently enable the operator to introduce easily a probe which at first could not be gotten in at all. Having succeeded in introducing a No. 5 or No. 6 probe well into the sac, the writer does not hesitate to use such force as may be necessary to carry it, through every obstruction, to the floor of the nose. It is entirely safe to do this, provided the force is exerted in the right direction and we are sure the probe has fairly entered the lachrymal sac. Some nose-bleed, perhaps a little ecchymosis in the region of the lachrymal sac, and a slight temporary increase of the existing inflammation are the only ill consequences likely to ensue. If, during the early stages of the treatment, pain and soreness are complained of, a lotion of acetate of lead and opium or boric acid and opium is prescribed. The writer, except in dealing with young children, when a few whiffs of chloroform answer a better purpose, always makes several applications of cocaine (4 to 100 solution) or holocaine (1 to 100 solution) to the inner corner of the eye before probing the duct. Although this does not render the operation entirely painless, it makes it much more endurable. He has also thought that he derived benefit from adding cocaine to the vaseline with which the probes are smeared before being passed. This, of course, does not make the introduction of the probe less painful, but it lessens the pain caused by its presence in the duct and by its withdrawal. The length of the interval between the successive probings must be determined, in a great measure, by the sensitiveness of the sac and duct. If the irritation and soreness which the passage of the probe excites are not marked, and subside quickly, which

usually happens, the probing should be repeated every other day; but if they are more pronounced, it is better not to repeat it oftener than once in three or four days. It is nearly always practicable, and is certainly desirable, each time that the probe is introduced to increase the size by one number; occasionally a number may be skipped, but this is not often the case. When, on the other hand, a size has been reached that is quite tight, it is best not to go on to the next number until by passing this one several times it has become looser. It is well to allow the probes to remain in the duct for from ten to twenty minutes. As to the size of the largest probe which should be used, it has been stated already that it is not necessary, in every case, to employ one of 4 mm. diameter (No. 16); but, as a rule, it is certainly best to do so, since by such thorough dilatation the cure of the case is hastened, and the danger of relapse greatly lessened. When a case is doing well, and No. 14 or No. 15 is passed with some difficulty, it is not expedient to employ a larger probe; but, on the other hand, if the improvement is not satisfactory, and the lining membrane of the duct gives evidence of still being diseased, the use of a larger probe (though it may be passed at first with some difficulty) is indicated, and will almost certainly be of benefit. After as large a probe has been introduced as seems desirable, the interval between the probings is gradually increased, first to four or five days, then to a week, and then to ten days or a fortnight. Finally, when all evidence of inflammation has disappeared, and the strictures show no tendency to recontraction, a period of a month or six weeks is allowed to intervene, and when two or three such intervals have passed, without any symptoms of a relapse, the probing is discontinued, and the case is dismissed as cured. If the use of the probes is discontinued while there is still a blennorrhœa of the sac or inflammation of the duct walls, a recurrence of the strictures is not improbable.

Usually, after these long intervals, it is not difficult to introduce the probe which has been previously passed; but occasionally, owing to a contraction occurring at the point of juncture of the canaliculus and the sac, the probe is arrested at this point and a smaller one has to be substituted. To meet this difficulty, and also, in the early stages of the treatment, to overcome strictures existing at this point which prevent the introduction of probes as large as otherwise might easily be passed, the writer has recently devised the sharp-pointed probe shown in the accompanying illustration* (Fig. 3101). While this probe is manifestly unsuited to probing the duct itself, it has been found most useful for the purpose for which it was intended—the rapid and effectual dilatation of strictures or contractions at the juncture of the canaliculus and the sac. For several millimetres from the tip, as is shown in the illustration, it is quite slender and then dilates rapidly to a much larger size. The slender portion has been made to correspond in size to a No. 3 probe, the larger portions to No. 12 and No. 14, respectively. To effect the requisite dilatation it is necessary to pass it only a short distance into the duct, when it may be with-

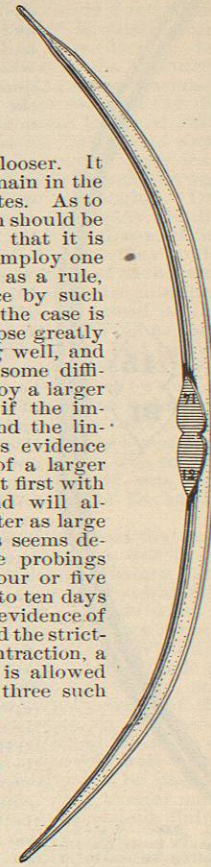


FIG. 3101.—Theobald's Supplementary Probe.

*Transactions of the American Ophthalmological Society, 1901; American Journal of Ophthalmology, September, 1901.

drawn and one of the ordinary probes passed to the floor of the nose.

The writer has never thought any of the contrivances for applying astringents, or other medicated solutions, to the sac and duct—such as the syringe of Anel and the more recently-proposed fenestrated hollow probe—of much practical value; but in every case he prescribes an antiseptic or astringent collyrium, which the patient is carefully instructed to drop into the inner corner of the eye, with a pipette, three times a day; and this he regards as an important adjunct to the probing treatment, especially when there is blennorrhœa of the sac (which there usually is during the early part of the treatment) or inflammation of the lining membrane of the duct. Before making this application the patient empties the sac of any tears or mucus which it may contain by pressure with the finger, and then, to facilitate the entrance of the drops into the sac and duct, he is instructed, after having instilled them in the neighborhood of the inner canthus, to look upward and wink the lids. The collyrium which has been found most useful is bichloride of mercury dissolved in normal salt solution (1 to 12,000 to 1 to 8,000); a solution of alum and boracic acid—one or two grains of the former and ten grains of the latter to an ounce—has also given good results. When there is a decidedly purulent discharge from the lachrymal sac a weak solution of protargol (2 to 100 to 4 to 100) will be found efficacious. The use of the collyrium should be kept up, not only throughout the treatment, but for some time after the introduction of the probes has been discontinued. The condition of the nasal mucous membrane should be looked to, and should receive such treatment as may be called for. Constitutional remedies may also be required, tonics and alteratives being useful in some cases, and muriate of ammonia being especially indicated when there is nasal catarrh.

The length of time during which the probing is continued varies greatly in different cases. The strictures yield readily, and the epiphora, the blennorrhœa of the sac, and the inflammation of the lining membrane of the duct disappear quickly in some cases, while in others the improvement is slow. It is never safe to stop the use of the probes altogether, as long as the epiphora persists and there are any traces of inflammation present; but in obstinate cases we may vary the interval between the probings, increasing it considerably at times, for it occasionally happens that the inflammation is kept up by the too frequent use of the probes. To supplement the dilatation effected by the probes the writer has employed electrolysis to a limited extent, but it has not seemed to him that much good was accomplished thereby.

Are the results obtained by this rather tedious, and to the patient somewhat trying, plan of treatment satisfactory? Does it permanently cure a considerable portion of the cases in which it is employed? And is it really an improvement upon the innumerable other methods which have preceded it? The writer's judgment upon these points will, perhaps, hardly be regarded as unbiassed; he has no hesitation, however, in giving an emphatic affirmative reply to each of these interrogatories. If the patient can be kept under the observation of the surgeon, and if, having confidence in him, he is willing to accept his dictum as to the size of the probes to be employed and the duration of the treatment, the cases are extremely few in which an absolute and permanent cure cannot be obtained. The cases which fall by the way-side, the patients who become discouraged when the treatment is but half accomplished and discontinue their visits to the surgeon, are not few; but those who hold out to the end are almost sure to reap their reward by obtaining entire relief from their previous discomforts. The writer does not claim that no failures occur. They do happen in a small minority of cases, even when every detail of the treatment has been carried out. There are two classes of cases in which the treatment is more likely to be unsuccessful: When the stenosis of the duct is dependent upon, and associated with, ozæna or severe nasal catarrh, the strictures show a greater tendency to recur,

because, though the canal may have been widely dilated, its lining membrane is not apt to assume a healthy condition so long as there exists pronounced disease in the contiguous lining membrane of the nose. In another class the canaliculi exhibit a persistent inclination to become occluded at their point of juncture with the lachrymal sac, and in consequence of this we not only have the epiphora re-established, but, probably because of the tears not passing through it, the nasal duct itself is apt to become again obstructed.

There are also some sources of failure which, by being kept in mind, may be avoided. For example, the writer has in several instances met with cases that had previously been treated with only partial success, in which there was discovered, close to the lower extremity of the duct, a stricture which there was good reason to believe had never before been penetrated by the probe. Under such circumstances, when the probe was first passed through this stricture to the floor of the nose, the patient at once exclaimed that the sensation produced was a new one, and that the instrument had never before seemed to "go so far down." Of course, such a mistake as this must necessarily render the treatment of no avail. The operator should always bear in mind that in occlusion of the nasal duct multiple stricture is the rule rather than the exception, and that the strictures, which may be circumscribed and annular, or ill-defined and of large extent, are liable to be encountered at any point in the duct from its upper rim to its valve-like lower extremity. When doubt exists as to the probe having reached the floor of the nose, an endeavor should be made to see the tip of the probe by light reflected into the nose or to touch it with a bent probe introduced through the anterior nasal orifice. Another mistake which may be made is in the introduction of the probes into the lachrymal sac. At the outset of the treatment, especially, there is at times considerable difficulty in accomplishing this owing to the existence of a constriction at the juncture of the canaliculus and the sac, and if, by mistake, the probe is turned up and forced down into the nasal duct before its point has fairly entered the sac, a false passage will be made directly from the canaliculus into the duct. If the probes are afterward passed through this false channel, the probabilities are that the natural channel into the sac will after a time become closed, and, as the false passage is very apt to share the same fate ultimately, it is evident that the treatment will come to naught.

During an attack of acute inflammation of the lachrymal sac it is never prudent to attempt the introduction of probes. It will be time to begin this after the acute symptoms have been completely relieved by the means which have been already described. The writer has not found it necessary to resort to any special measures to promote the closure of lachrymal fistule, except, perhaps, to touch exuberant granulations, if they are present, with a crayon of nitrate of silver or a crystal of sulphate of copper. He has always found that, as the condition of the lachrymal sac and the duct improve under the use of probes and antiseptic collyria, the fistule heal without difficulty.

Blennorrhœa of the lachrymal sac, with or without epiphora, is occasionally met with in infants. Operative treatment is only exceptionally called for in these cases; but if the antiseptic collyria which have been mentioned fail to relieve the condition after having been tried perseveringly, the canaliculus should be divided and probes be introduced. The outcome of this treatment is usually very satisfactory, and to effect a cure it is seldom necessary to repeat the probing oftener than four or five times.

The possibility of mistaking tumors lying in the region of the lachrymal sac, or extra-cystic abscesses, for distention of the sac should be borne in mind. The writer has once or twice seen cysts in this region which in appearance closely resembled "mucocele."

At one time the writer used quite extensively the leaden styles of Dr. John Green; but the results obtained from them were not encouraging, and for some years he has not employed them. Although they usually afford

relief while they are in the duct, a return of the former symptoms is very apt to follow their withdrawal. As a substitute for the probe in cases which can remain but a short time under the surgeon's care, they, or styles made of aluminum, may be used. Under such circumstances, however, the writer not infrequently has found it practicable to teach patients to probe their own lachrymal ducts; and for this purpose he has devised the probe shown in Fig. 3102. After the duct has been well dilated by the passage several times of one of the larger probes, it is not difficult for the patient to introduce a probe of this pattern, usually No. 13 or No. 14. With a probe of this size there is practically no danger of making a false passage, and the previous instillation of a few drops of cocaine renders the procedure almost painless. In this way relapses, liable to follow a too early discontinuance of the probing, are obviated and the permanency of the cure is assured.



FIG. 3102.—Modified Form of Lachrymal Probe to be Used by Patients. (Actual size.)

It only remains to be said that the writer has been so well satisfied with the results which he has obtained in the treatment of nasal-duct strictures by the thorough dilatation plan which he pursues that he has not been tempted to make trial of the treatment by division recommended by Stilling. He can scarcely persuade himself, however, that permanent benefit would often result from this operation, unless it were followed by systematic and thorough dilatation. The operations of destruction of the lachrymal sac and extirpation of the lachrymal gland, which have been referred to as measures recommended in intractable cases of obstructive lachrymal disease, are also procedures which he has never resorted to. There may be cases, perhaps, in which it is proper to employ these extreme measures, but he has not encountered them and he believes they are of very rare occurrence.

Samuel Theobald.

¹ Transactions of the Medical Society of the State of New York for the year 1876, p. 150.

LACTANIN—Bismuth di-lacto-mono-tannate—is a bismuth compound of lactic and tannic acids which occurs as an odorless, tasteless, yellow powder insoluble in water. For the diarrhoea of infants, or in tuberculous or simple enteritis, Moncorvo uses it in some such combination as: R Lactanin, gr. xxiv.—xxxvi. (1.6–2.4 gm.), syrapi acaciae, ℥ i. (30 c.c.). M. Sig.: One teaspoonful three to five times a day. W. A. Bastedo.

LACTATION. See *Breast, Female, and Galactagogues.*
LACTEALS. See *Lymphatics.*

LACTIC ACID.—Of the isomeric bodies known chemically by the generic name of *lactic acid*, the common acid, called technically *isolactic acid*, is the one used in medicine. This body is a product of a certain form of fermentation of sugar, a fermentation that occurs very readily in the case of milk. Hence the name and the common source of this acid. Lactic acid is official in the United States Pharmacopœia under the title *Acidum Lacticum*. Lactic Acid, and is required to be of a strength equal to seventy-five per cent. of absolute lactic acid (HC₃H₅O₃). Lactic acid is a syrupy liquid, colorless and odorless, but sharply sour to the taste. It mixes freely with water, alcohol, and ether, is hygroscopic, and should be kept in well-stoppered bottles. The specific gravity of the official acid is about 1.213 at 15° C.

Although strongly acid, lactic acid is neither corrosive nor poisonous. It is contained, normally, in gastric

juice, and accordingly is suggested as an adjuvant to pepsin in atonic dyspepsia. From theoretical considerations it was at one time expected to prove hypnotic, but it has not justified the expectation. Also it was vaunted as an antidiabetic medicine, but again has failed of success. The only really notable properties of the acid are that it dissolves to a considerable extent freshly precipitated calcium phosphate, and hence is useful in the preparation of the so-called *syrup of lactophosphate of calcium*; and that it dissolves false membranes, and so may be employed locally in diphtheria and croup. In the latter application the acid may be used by spraying or gargling, in admixture with water, of a strength of from four to twenty per cent. Lactic acid may be administered internally in teaspoonful quantities or more, well diluted with sweetened water. Edward Curtis.

LACTOL, lacto-naphtol, a lactic acid ester of beta-naphtol, is a tasteless substance which, splitting into its components in the intestine, acts as an intestinal antiseptic. Its dose is 0.25–0.5 gm. (gr. iv.—viiij.).

W. A. Bastedo.

LACTOPHENIN, lactyl para-phenetidin (C₈H₉OC₂H₅.NH.C₂H₅O₂), is produced by the action of lactic acid on phenetidin in the presence of dehydrating agents. From phenacetin it differs only in the substitution of a lactyl group (C₂H₃O₂) for the acetyl group (CH₃CO). It occurs as a white crystalline powder without odor and with a bitterish taste, is split into its components by acids and alkalies, and is soluble in 300 parts of water (some authorities say 500 parts) at 15° C., in 55 parts of boiling water, and in 8.5 parts of alcohol. It is eliminated in the urine as paramido-phenol, which gives a deep red color with ferric chloride.

Physiologically, it does not differ essentially from phenacetin, except that its sedative and hypnotic tendency is greater. As an antipyretic, it reduces temperature rapidly and without much depression, though sweating may occur. Untoward effects following a dose of eleven grains were: prickly heat, erythema, and swelling of lips, tongue, and vagina. Withauer reports four cases of catarrhal jaundice, and Wenzel one case of jaundice with clay-colored stools following fourteen grains. Kronig has recorded a case of cyanosis and death, though the amount of drug taken is not stated. Experimentally Strauss produced hemorrhagic erosions in the gastric mucous membrane of a rabbit, and in another congestion and profuse secretion of mucus in both stomach and duodenum.

There is abundant clinical evidence that lactophenin is a valuable antipyretic and analgesic. Franz Riedl, from a careful study in a large number of cases, came to the conclusion that it is a specific for acute articular rheumatism, is antipyretic but not at all a specific for typhoid fever, and has no influence on the intensity or duration of sepsis, pneumonia, or erysipelas. Clevenger finds it analgesic in various acute pains such as toothache from alveolar abscess, but declares it useless in the shooting pains of locomotor ataxia, the pains of syphilis of the cord, and those associated with cancer. Von Jakesch, Martin, Jacquet, Caillé, and many others have used it with good results in various febrile conditions, rheumatism, colic, the pains accompanying the onset of acute fevers, neuralgia, and as a sedative in restless and nervous conditions. Cristiani gave it in over two hundred cases of insomnia in the insane, and from this experience concluded that it was capable of inducing quiet, deep sleep for from four to nine hours. Combined with the extracts of belladonna and stramonium, Martin employs it for ovarian neuralgia. A mixture of caffeine gr. ij. (0.13 gm.), quinine hydrobromate gr. iij. (0.2 gm.) and lactophenin gr. vi. (0.4 gm.), makes an excellent capsule for migraine. The dose is gr. iij. to viij., or even gr. xv. (0.2–0.5–1.0 gm.) for an adult, given dry on the tongue, suspended in syrup, or in capsule or cachet. The dose for a child is gr. ss. to gr. ij. (0.03–0.13 gm.), and several writers speak of its apparent safety for children. W. A. Bastedo.

LACTUCARIUM.—"The concrete milk juice of *Lactuca virosa* L. (fam. *Compositae*)" (U. S. P.). Although thus defined, the product is actually obtained from several species of the genus. The one specified is native of Central and Southern Europe and is also cultivated for the sake of the lactucarium. It is a coarse, narcotic-smelling, and bitter-tasting biennial herb, with an upright, prickly, paniculately branching stem a metre or more in height, and long, spreading, ovate or oblong, sinuate-dentate, pointed, and prickly leaves, and flowers similar to those of the common garden lettuce.

The herb itself has been official in the British Pharmacopœia, but is no longer so. *L. altissima* Bieb., of the Caucasus, is a gigantic species cultivated in France for the production of a French variety of lactucarium. *L. scariola* L., another prickly European species, is also said to yield a portion of the drug, as well as *L. sativa* Linn., the common salad or garden lettuce. The American species, *L. canadensis* L., has also been experimented with; it yields a lactucarium of but little bitterness and of inferior quality.

Lactucarium, in its present form, was introduced by Dr. Cox, of Philadelphia, who collected it from garden lettuce at the end of the last century. Lettuce itself, as a medicine, is of much older date, and garden lettuce, as a salad, has been cultivated for several hundred years.

COLLECTION.—After the plants have sent up flowering stems, they are cut off about a foot from the top, when the "milk" flows out freely; this is wiped off with the finger and conveyed to a little cup; the operation being continued with successive stems until the cup is sufficiently filled. Fresh slices are cut off and fresh collections made daily, throughout the season. As first exuded, it is liquid and pure white, but it soon sets upon exposure, and turns yellow and then brown. When it has coagulated, it is emptied from the collecting vessel and dried by gentle heat. The form of lactucarium varies with the details of its collection. French samples are in small circular cakes, the English (Scotch) is in broken fragments, and the German, which comprises most of that imported here, evidently consists of quarters of a plano-convex cake cut up before it is quite hard. It is, however, brittle, and often much broken.

DESCRIPTION.—Lactucarium is a brittle, structureless solid, of a gray or dull red-brown color, whitish or yellowish within, as shown by fresh fracture, of a waxy lustre when freshly cut, heavy narcotic odor, and disagreeable bitter taste. It is a composite substance, and not wholly soluble in any one menstruum. Alcohol and ether dissolve portions of it; boiled with water, it forms a turbid mixture.

COMPOSITION.—The most abundant ingredient, constituting nearly half of it, is *lactucerin*, or *lactucon*, a wax-like substance, common to other milky juices. *Lactucin* is, however, its active principle. This crystallizes in pearly scales; is soluble in boiling water, cold alcohol, and acetic acid, but not in ether, and is very bitter. Yield, 0.3 per cent. *Lactucic acid* and *lactuopicerin* are other constituents. Besides these, *lactucarium* contains vegetable tissue, caoutchouc, gum, cellular tissue, and other vegetable substances, but no starch.

ACTION AND USE.—Common lettuce is well known to be slightly soporific; its effects are occasionally quite marked. The various extracts of lettuce are also more or less so. These apparently contain a trace of hyoscyamine, but it is doubtful if this gets into the lactucarium. Lactucarium has so far shown itself to be an uncertain medicine, often of no value, but, when good, an efficient and pleasant hypnotic; its power of overcoming pain is slight when compared with opium—in fact, almost none,—but simple discomfort or moderate distress is occasionally relieved by it. In cardiac asthma and restlessness it is frequently useful, and it may be tried in numerous cases in which opium is indicated but not well borne. It is free from the subsequent constipation and headache of opium.

ADMINISTRATION.—The uncertain quality of this drug makes its dose a tentative one, but 0.5 gm. or 1 gm.

(gr. viij. ad xv.) should show some effect. It may be given in powder or pill, or the fifty-per-cent. official tincture. From the extract, a syrup (*Syrupus Lactucarii*, of ten-per-cent. strength of the tincture, five per cent. of lactucarium) is made; a useful vehicle and adjuvant for opium or other hypnotics. W. P. Bolles.

LADANUM.—Labdanum. A resin collected in Greece and the Grecian Islands from several species of Rock Rose (*Cistus Creticus* Linn., *C. ladaniferus* Linn., *C. Cypricus* Lam., etc.; Fam. *Cistaceae*), whose stems and branches abound in a sticky exudation. Two methods, both coarse and dirty, are in vogue for collecting it. The first is to whip or rake the bushes by an instrument having a number of leather thongs at the end, to which the resin sticks, and from which it is scraped off; the second, and more common, has been in use for many centuries, viz., to comb and press it out from the beards and wool of goats and sheep which pasture among it. It is then melted and manipulated, and often adulterated with other resins, or mixed with sand, etc., perhaps as much to give it solidity as for falsification. Common Ladanum is imported in snake- or worm-like coils; it is a dark gray or greenish-gray brittle solid, of resinous odor and a bitter balsamic taste. It consists of from twenty to eighty per cent. of *resin*, a small amount of *oil, gum*, and other vegetable products, and the rest of dirt, sand, or other foreign admixture.

ACTION AND USE.—The same as those of other resins. As a medicine it is obsolete; plasters, fumigations, etc., sometimes contain it. W. P. Bolles.

LAKE PARK WHITE SULPHUR SPRINGS.—Vernon County, Missouri.

POST-OFFICE.—Nevada. Hotels.

Nevada is a flourishing and beautiful little city, located in western Missouri, one hundred miles south of Kansas City. It is accessible by three railroads, viz., the Missouri, Kansas and Texas, the Missouri Pacific, and the Nevada and Minden Railroad. Lake Park, in which the springs are located, is an attractive spot one mile out from the city, and reached by horse-cars, which run every twenty minutes. The three principal springs are known as the "White Sulphur," the "Iron," and the "Clear Water" springs. No analysis seems to have been made, but the springs are beginning to attract considerable attention on account of their medicinal properties. The park is about one hundred and thirty acres in extent, and, besides the springs, contains two lakes which afford abundant opportunities for boating, bathing, fishing, etc. James K. Crook.

LAKE TAHOE, or CARNELIAN HOT SPRINGS.—Placer County, California.

LOCATION.—These hot and cold mineral springs are located on Carnelian Bay, at the northern end of Lake Tahoe. They form part of the attractions of this famous inland sea. They are reached by rail to Truckee, and from thence by stage over a good mountain road in about two and one-half hours' drive. The scenery en route is grand. The Truckee River is crossed and recrossed, mountainsides and heights are scaled, and fertile valleys, on which graze immense herds of cattle, are traversed. Forests of beautiful pine and cedar rear themselves at intervals, humming sawmills fill the air with life, and wild, romantic views greet the eye at every turn. Lake Tahoe is a noble sheet of water, having an altitude of 6,202 feet above the sea level. It is divided by the California and Nevada State line, has a length of 21 miles, a width of 12 miles, and is 1,645 feet in depth. The appointments at the springs resort are very complete. Excellent bathing facilities have been provided, where all kinds of cold or hot sulphur baths may be taken. The springs are about fifty in number, and are well kept and cared for. The waters are sulphurous and saline, and a few are carbonated. They contain sodium chloride, calcium sulphate, silica, organic matter, magnesium sulphate, and free sulphureted hydrogen gas.