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THE INVENTION AND EVOLUTION OF THE MIDWIFERY FORCEPS

**The Inaugural Address to the Midland Medical Society at
Birmingham on 26th October, 1900**

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READERS of Sir Walter Scott may remember an incident in *The Surgeon's Daughter* where with the aid of a king's messenger Matthias de Monçada entered the house of Mr Gideon Gray, surgeon in the village of Middlemas, to claim his erring daughter. "The whole militia of the sick lady's apartment" are seen keeping the intruders at bay, till the doctor himself came on the scene and after parley admitted that he "must surrender her to the laws of the country. 'Surrender, Doctor Gray! It's a shame to hear you speak, and you that lives by women and weans, abune your other means,' exclaimed his fair better part."

Pre-eminence of Midwifery in General Practice.

You see the shrewd wife of that country doctor knew well that the largest share of her husband's hard-earned fees accrued from his attendance on child-bearing women and on the children whom he brought into the world. Gideon Gray's experience in this respect corresponds to the experience of all his brethren, both in town and country who are engaged in general practice. When an obstetric teacher is called on to address

the members of a Medical Society composed to a large extent of general practitioners he knows, accordingly, that he has to speak to a company of his brethren, who, like himself, live by women and weans above their other means. And since you have done me the honour to invite me to deliver your Inaugural Address on this occasion, it has occurred to me that it might interest you to be told something of the History of the Midwifery Forceps. The instrument that is every day, perhaps I ought to add more emphatically, every night rescuing more lives and cutting short more pains than all the other instruments in the professional armamentarium, and that has been rendering this service for two hundred years—I fancy that even those of you who are most familiar, not only with its employment, but with the romance of its invention and the progress of its evolution, will not be unwilling to hear the story of its discovery and development over again.

Rise of Modern Midwifery.

Modern midwifery may be regarded as taking its origin towards the close of the sixteenth century, when Ambrose Paré revived and recommended in his surgical writings the operation of Turning as a means of delivery in difficult and dangerous cases, and his pupil, Guillemeau, still further popularised the procedure in his special work on Midwifery. Through the painful centuries women had depended for aid in their deliveries on members of their own sex who had acquired some skill and experience more or less in the management of labour, and who sometimes transmitted the practice from mother to daughter. These "Wise-women" had little or no medical knowledge or surgical skill. When they had a labour in hand where nature was insufficient they called in a surgeon or physician, too often when the life of mother or child, or both, was already doomed. The practitioner thus called in had most frequently to do what he could to terminate the delivery by some embryotomic procedure. To the dislike of the presence of a man, the sufferer had the added dread of a dangerous and often deadly operation when a medical practitioner was called in to aid a delivery. Apart from the rule of thumb knowledge that may have passed from one individual to another, midwives were dependent for any

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instruction they had on books written for them by men such as Eucharius Rösslin and Jacob Rueff.

Sage-Femme or Accoucheur?

A struggle was now about to begin, however, between them and the members of our profession as to whether the midwife or the doctor should be paramount in the delivery-room, in which the gradually extending power of the printing press gave the men who wrote and read the works on science and art an advantage over the women. It was not that there were absolutely no female writers on obstetrics. Louise Bourgeois, the Court *sage-femme* of Mary of Medici, Queen of Henry IV., wrote a book for the benefit of her daughter, in which she claims to have proposed and carried out the operation of Turning in cases of placenta praevia, though she may have learned it from her husband who was a friend of Guillemeau. Marguerite de Tertre also, the *sage-femme-in-Chief* at the Hotel Dieu, wrote a text-book for her pupils in 1717. But neither these, nor the works of Justine Sigmundin in Germany, or of Jane Sharp or Mrs Nihell in England, could hold their ground against the many volumes that were produced by men trained as physicians and surgeons, some of whom began to make a specialty more or less distinct of obstetrics.

Influence of Fashion.

In the middle of the seventeenth century another element came in to contribute to the transference of midwifery from the care of women to the charge of men—the element of fashion. Astruc is the authority for dating the era of man-midwifery from the confinement of Louis de la Vallière, the earliest of Louis XIV.'s concubines, in 1663. The Great Monarch, as his people loved to call him, was then passionately devoted to the fair, perhaps delicate, and slightly lame girl, and as she wished her condition and her confinement to be kept secret, he had her attended by Jules Clement, who afterwards attended members of the Royal family both of France and Spain, as well as other ladies of the Court. The custom which was begun in Royal circles in France and Spain and England gradually spread through the community, but it

was not till after many a tirade had been written against men-midwives and man-midwifery that in the course of the eighteenth century the doctors were left supreme. In the transition period it might happen that a lady chaffed by her friends for having been laid by a woman would reply, "But my husband paid a doctor to be in the house at the time though I didn't need him." And has not Tristram Shandy related how his father had engaged Dr Slop against the mother's wishes to be in attendance, and how the doctor sat in Shandy Hall, sometimes dozing, sometimes discussing various themes with the anxious father and Uncle Toby, until he was summoned eventually to deliver the lady with disastrous results to the bridge of the baby's nose?

Harmless Forceps Wanted.

The power of the printing-press, however, and the power of fashion conjoined would not have sufficed to give men predominance in the lying-in room unless they had been able to devise harmless forceps for the extraction of the infant when its head was impacted in the pelvis. From the time that Paré had demonstrated the value of Turning, that operation had enabled them to deliver living mothers of living children in many cases of difficulty, and the growing appreciation of it tended to lessen the dread with which the advent of the surgeon was regarded. As a result, we find towards the close of the seventeenth century, practitioners directing attention more and more freely to the difficulties of labour, and casting about for some safe method of extracting the impacted head—Mauriceau, Peu, De La Motte, and others, telling us the meanwhile that they preferred to meet with difficult breech or transverse cases rather than with the incarcerated head. There were rumours in the obstetrical world that the much-needed implement had been discovered. But the leading obstetricians remained incredulous.

The First Published Forceps.

Jean Palfyn, Anatomist and Surgeon in the City of Ghent, has the merit of having first offered to the profession a rudimentary pair of safe forceps. He had already in 1708 published an anatomical work, and when in Paris, in 1720,

putting a volume through the press, he submitted to the Royal Academy of Sciences a forceps which is figured in Heister's surgery (Fig. 1). It appears as a spoon-shaped instrument with a wooden handle capable of application to the side of the infant's head and worked as a lever. Or two of them might be used—one applied to each side of the head—and the parallel handles bound together with tapes. A similar instrument was claimed about the same time by another Belgian, Gilles le Doux of Ypres, as his invention. De la Motte writing in 1722 in his commentary on the last of his cases promises if the special *tenettes* which he has contrived prove to be as serviceable as he expects, to give a true and faithful account of their value. "For," he goes on to say, "far be it from me to make a secret of these instruments in the fashion of a certain surgeon of Ghent, who came to Paris some years ago to propose to the



FIG. 1.—PALFY'S FORCEPS (FROM MULDER).

chief of the Academy of Science a certain iron instrument by means of which he vaunted himself able to deliver all women when the heads of the children were caught or impacted in the pelvis without causing them any harm. One of the Master Surgeons in Paris who had been charged with the examination of the instrument as to the possibility of the feat and the pretended value of its application, did me the honour of asking what I thought of it, without saying more about the instrument as he had been pledged to secrecy as to its structure. I did not hesitate to tell my friend that whatever the construction of the instrument the thing was as impossible as to pass a cable through the eye of a needle. In fact, how could a steel or other instrument pass the place where the head is arrested or incarcerated in such a fashion that one can't introduce a catheter for the evacuation of urine that may have been retained several days, any more than a clyster pipe or even a

leaf of myrrh. How, I say, could one introduce this instrument and make it work so precisely that it would draw the child out of the peril to which the narrowness of the canals exposed it. It is certainly a snare and a delusion. If the thing be as true as it is false, and the man die without making this instrument known, he would deserve to have a worm gnaw his entrails throughout eternity, because of the crime he commits in not giving the means of saving the lives of an infinite number of poor children who perish for want of it, all human science not having been able till now to discover it. But on the other hand he will be crowned with benedictions if what he advances be true, for the great good this instrument could do would make him be blessed by God and man through the ages of ages (*pendant les siècles des siècles*)."

William Chamberlen, Huguenot Refugee.

For more than a century the forceps had already been pursuing a career of beneficence. But its employment was restricted to the hands of the members of a very remarkable family, which furnished physicians to King James I., King Charles I., King Charles II., King James II. and King William, to their respective Queens, and to Queen Anne. William Chamberlen, a Huguenot doctor in Paris, may have been a friend of Ambrose Paré as they were fellow-citizens, fellow-practitioners, and fellow-believers. Paré was only saved from slaughter on the night of St Bartholomew by the intervention of the King, Charles IX., who hid him in his own closet. William Chamberlen had made his escape to England a short time previously, bringing with him his wife, Genevieve Vingnon, and his eldest son Peter, a lad somewhere in his teens.

Two Peter Chamberlens, Brothers.

He had several children, but the only other one that concerns us was a boy born in 1572, some four years after their arrival in Southampton. To the confusion of their biographers this younger son received the same name as his elder brother Peter. These two brothers both became celebrated London physicians, and laid the foundation of the

family fame and fortune as accoucheurs. The elder of the two, who outlived the younger, is found already in 1614 filling the office of surgeon to the Queen of James I., by whom he was presented with a diamond ring. When Henrietta Maria, wife of Charles I., miscarried of her first child we are told "she had neither midwife nor physician about her; only the poor town midwife of Greenwich was sent for who swooned with fear as soon as she was brought into the Queen's chamber, so as she was forced presently to be carried out; and Chamberlayne the surgeon was he alone that did the part of a midwife." This elder Peter had no son to succeed him, but the younger had several. Of these the only one who continued the professional succession bears again the name of Peter.

"Dr" Peter Chamberlen.

This third Peter is distinguished from his father and uncle by the designation of doctor, for whilst they had only qualifications from the Company of Barber-surgeons, this fourth member of what he himself calls "an Asclepiad family" attained the degree of Doctor of Medicine in the University of Padua when he was only eighteen years of age, and at later periods he took the same degree in other universities. Dr Peter Chamberlen was a man of boundless energy and great versatility, and among his many projects he devised a scheme for the incorporation and registration and education of midwives. He failed, partly, perhaps, because the time was not ripe, but partly also because he wanted, as one "Philoletes" said at the time, "to get himself made Vicar-General of the midwives in city and suburbs; and for the maintaining a garb fitting the greatness of his place he would have a groate for every childe borne within his jurisdiction, for which he would have kept good orders and rules amongst them, set up a lecture and, himself a keen reader, unfolded the hard places and passages in Aretæus and Aristotle's Problems and in all things that concerned women's business have been a very ready necessary young man." He attained such fame that the Emperor of Russia wrote with his own hand a letter to Charles I. begging him to allow the doctor to enter his service; and he acquired such a fortune that he became possessed of a

property in Essex, Woodham Mortimer Hall, where he died in the eighty-third year of his age. Dr Peter, besides other children, left three sons, Hugh, Paul and John, to whom he communicated the "knack in midwifery" which "Philolethes" says his father had left with him.

Dr Hugh Chamberlen, Senior.

Dr Hugh is, like his father, Dr Peter, a man of many schemes. But he interests us chiefly from his relations with the great Parisian obstetrician, Mauriceau, and his boast of the family secret. Mauriceau tells us that in August 1670 he had on hand a case of difficult labour in a little primipara of thirty-eight, when there appeared on the scene an English physician named Chamberlen, who from father to son had practised obstetrics in London, where for long he had acquired the supreme degree of reputation in this art. Mauriceau thought the labour impracticable; but the Londoner said he could deliver her safely in a quarter-of-an-hour. He was left to try his skill, worked away for three hours without stopping to take breath, and seeing the woman like to die in his hands, at last desisted. She only survived the injuries he had inflicted on her four-and-twenty hours, and died undelivered. At the autopsy Mauriceau found the uterus all torn and perforated in various places, and he goes on to say that this doctor had come to Paris six months before hoping to make his fortune, and circulating a rumour that he had a private means of terminating labours of this kind. He had even proposed to the first physician of the king to sell him his pretended secret for a remuneration of 10,000 crowns, but his failure in this one case so disgusted him that he set off home a few days after, seeing that there were in Paris more able obstetricians than himself.

The Boast of the Family Secret.

In 1672 Dr Hugh published a translation of Mauriceau's midwifery, and in the preface he wrote some sentences that made a hum through the whole obstetric world. "In the 17th Chapter of the second Book," he writes, "my Author justifies the fastening Hooks in the Head of a Child which comes right, and yet by reason of some difficulty or disproportion

tion cannot pass ; which I confess hath been, and is yet, the practice of the most expert Artists in Midwifery, not only in England, but throughout Europe : and hath very much caused the Report—that where a Man comes, one or both must necessarily die : and is the reason why many forbear sending till the child is dead or the mother dying. But I can neither approve of that practice nor those delays ; because my Father, Brothers, and myself (though none else in Europe that I know) have by God's Blessing and our Industry, attained to and long practised a way to deliver Women in this case without any prejudice to them or their Infants : though all others (being obliged for want of such an Expedient to use the common way) do, and must endanger, if not destroy, one or both with Hooks. By this manual Operation may be dispatched (when there is the least difficulty), with fewer pains and in less time, to the great advantage, and without danger both of Woman and Child. If, therefore, the use of Hooks by Physicians and Chirurgeons be condemned (without thereto necessitated by some monstrous Birth) we can much less approve of a Midwife's using them, as some here in England boast they do, which rash presumption in France would call them in question for their Lives.

“ In the 15th Chapter of this Book, my Author proposeth the conveying sharp Instruments into the Womb to extract a Head, which is a dangerous Operation, and may be much better done by our fore-mentioned Art, as also the inconvenience and hazard of a Child dying thereby prevented, which he supposeth in the 27th Chapter of this second Book.

“ I will now take leave to offer an Apology for not publishing the Secret I mention we have to extract Children without Hooks where other Artists use them, which is, that there being my Father and two Brothers living, that practise this Art, I cannot esteem it my own to dispose of, nor publish it without injury to them : and think I have not been unserviceable to my Country, although I do but inform them that the fore-mentioned three Persons of our family and mySelf can serve them in these Extremities with greater safety than others.”

There were various conjectures as to what the Chamberlen secret could be. Some thought it might be the lever ; others

imagined it was some modification of the crotchets, as in one of Hugh's notes he speaks of "our hooks": and again, as he speaks of it once as applicable to shoulder cases, some conjectured that it was only after all a special knack in turning. Some regarded his statement as the vain boast of a charlatan. He was a restless spirit, got mixed up with a disastrous land-bank project that was to make everybody rich, and is supposed to have died in exile in Holland where he seems to have sold his secret or part of it to Roonhuysen. It has never been cleared up what passed between Hugh Chamberlen and the Dutchmen. Hinze says Roonhuysen and Ruysch divided the secret between them so that each had a blade. There is some evidence that they possessed a kind of forceps, though the implement they were eventually known to use was the lever. What is certain is that Roonhuysen and Ruysch with their colleagues and successors in the Academy of Amsterdam made a profit of the business, by getting a law passed that no one might practise midwifery without first having paid them to be taught the use of their instrument.

Dr Hugh's brothers, Paul and John.

Paul, Dr Peter's second son, had a good deal of the quack in him, and made traffic with an Anodyne Necklace which should let the babies who wore it cut their teeth painlessly, and give women in labour "an extraordinary easy time." Of John it is known only that he possessed the family secret and practised midwifery with success.

Dr Hugh, junior, the last of the Chamberlens.

Hugh had a son of his own name who kept up the family practice and the family position till his death in 1728. Freind in his letters to Mead on the small-pox in 1719, says of his fifth and sixth patients—cases of small-pox respectively in a pregnant and a puerperal woman—that they were seen in consultation with H. Chamberlen, of whom he speaks as *peritissimus* and *vir experientissimus*. He moved in the highest circles and was on specially intimate terms with the Duchess of Buckingham, daughter of James II. In Westminster Abbey an imposing cenotaph celebrates his memory with a

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long Latin elegy composed by his friend Atterbury, Bishop of Rochester, which tells that the monument was raised by Edmund, Duke of Buckingham, in gratitude for life saved at birth, and for health often restored and at last confirmed. A journal in announcing his decease says, "He was the last of that ancient family who practised the art of Midwifery in the Kingdom except Dr Walker in Great Suffolk Street, who (also) is grandson to Dr Peter Chamberlen."

Discovery of their Secret.

That the instrument which gave the Chamberlens for four generations their pre-eminence as obstetricians was none other than the safe midwifery forceps was conclusively demonstrated in 1813. In that year there was discovered in a closet above the porch of Dr Peter Chamberlen's old mansion, Woodham Mortimer Hall, a chest, the obstetrical contents of which were deposited by Mr Carwardine among the Archives of the Medico-Chirurgical Society of London in 1818, where they may still be seen. The most important are four pairs of efficient midwifery forceps. But for years before the last of the Chamberlens was laid in Westminster Abbey their secret had begun to leak out. How it came about no one knows. It is told of Roonhuysen's secret that he had an assistant to whom he had often promised to reveal it and as often put him off. One day when he had just returned from a labour case an Amsterdam Burgomaster required an interview with him. In the hurry he tried to hide his tools; but whilst the interview was going on Vanderswam took them out and sketched them. Some medical friend or some intelligent midwife may have got a sufficient glimpse of the Chamberlen tongs to enable them to describe their construction. Le Roy avers that Palfyn when in London had a sight of Chamberlen's forceps. Johnson tells us he possessed a pair of forceps that belonged to Mr Drinkwater, surgeon and man-midwife in Brentford, who began practice in 1668, and died in 1728. In 1733 Edmund Chapman published an *Essay on The Improvement of Midwifery* in which he describes the use of the forceps and speaks of them as being of different sorts and well known to all the principal men of the profession, both in

town and country. In the same year Mr Alexander Butter published a description and gave a sketch (Fig. 2) of Dusé's forceps in the third volume of the *Medical Essays and Observations published by a Society in Edinburgh*. The editor of this volume in noticing Chapman's work finds fault with him for not describing his instrument, and in 1735 Chapman acted on



FIG. 2.—DUSÉ'S FORCEPS FIGURED BY BUTTER.

the hint and gave a figure (Fig. 3) of his forceps in a second edition of his work. In 1734 Dr Edward Hody published the *Cases in Midwifery* which had been recorded by Mr Giffard, a London practitioner, who for several years had made use of a pair of forceps of which a figure is shewn. In



FIG. 3.—CHAPMAN'S FORCEPS.

France, besides Dusé, the Gregoires, father and son, Mesnard, Levret and others began to use and uphold the value of the forceps. But the man who did most to popularise its employment and put into the hands of his professional brethren the implement that gave them the command of the delivery-room was William Smellie,

The Greatest of British Obstetricians.

The story of Smellie's life has been ably and sympathetically told by his fellow-townsmen, Professor Glaister. Born in 1697 and brought up in Lanark, he got there his first professional instruction at the hands of the parish doctor, Mr Inglis, and afterwards in Glasgow furthered his knowledge, probably in the University and as a pupil of Dr Gordon.

There he became friendly with another medical aspirant, Tobias Smollett, who was afterwards to gain laurels in other fields and to assist Dr Smellie in the writing of his books and putting them through the press. From the first Smellie took an interest in midwifery, made notes of special cases, kept himself abreast of the literature of the subject, procured a pair of the forceps described by Butter, which he found unsatisfactory, and after nineteen years' practice in Lanark set out to London and Paris in 1739 to glean what he could in these great centres of obstetrics. He remained in London not only to extend his own knowledge and experience but to become the foremost of a large band of teachers, to put the impress of his genius on the apparatus of the accoucheur, and to publish the works which have given him a place among the immortals. In 1759 he retired to the property of Smellom which he had purchased in the vicinity of his native town, and there in 1763 he died. The influence of his teaching may be judged from a sentence from Mrs Nihell's tirade against the practice of man-midwifery. "Think," she says, "of an army, if but of barely Dr Smellie's nine hundred pupils, let loose against the female sex, and of what a havoc they make of both its safety and modesty, to say nothing of the detriment to population, in the destruction of infants."

A Great French Rival.

I wish some of our French colleagues would render on behalf of Levret the same service that Professor Glaister has rendered the profession in the case of Smellie, and give us a sketch of the life and times of his great Parisian rival. Born in 1703, he lived through the epoch that saw the greatest transformations occurring in the theory and practice of midwifery. His active, ingenious mind led him to take a large share in the movements, which he was perhaps all the more free to do because a great financier, whom he attended in a lengthened illness, left him in 1739 a fortune that secured his independence. He attained the highest professional honours, and was accoucheur to the Dauphiness and chief of the French School of Midwifery ere he died in 1780. His brilliant services in the furtherance of the construction and use of the forceps would have been better appreciated if his ingenuity had

not led him to contrive a tire-tête for extracting the head left in the uterus after the trunk had been torn off, and if he had not been so enamoured of this contrivance as to recommend its use in some instances as a substitute for forceps in head-first cases also.

Construction of Forceps.

But it is time to turn from the men who handled the forceps to look more directly at the implement itself. It consists of two *Blades*, that in the earlier works are sometimes called *bows* or *claws*, for application to the foetal head. The blades, curved towards each other, are the most important parts of the instrument, so that each half is spoken of *κατ' ἑξοχὴν* as the blade—right or left respectively. They may present many

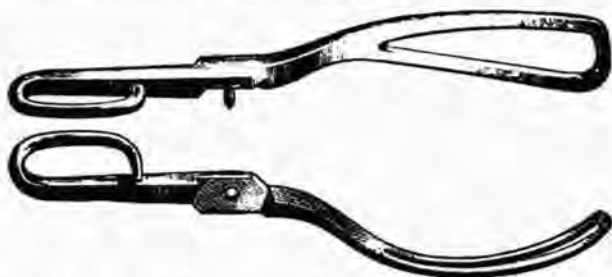


FIG. 4.—CHAMBERLEN'S FORCEPS WITH LOOPED HANDLES AND LOOSE PIN-JOINT (FROM AVELING).

variations in size, fenestration, and so on, but blades having a head-curve that is sometimes called foetal, or cranial, or cephalic, are found in every midwifery forceps. Then each blade is furnished with a *Handle* for purposes of manipulation. The third essential is the *Joint* or *Lock* where the two blades are adapted to each other and are usually crossed. If we look at the largest (Fig. 4) of the three types of forceps that Dr Peter Chamberlen's widow locked up in a box, along with her husband's last tooth, a New Testament, and Anne of Denmark's diamond ring, and hid for a century between the floor of one closet and the roof of another, we see the three elements in their simplest, and what may quite well have been their primitive form. Dr Aveling has shown very conclusively that the actual inventor of them was not

Dr Peter, as he at one time believed and affirmed, but his uncle, Peter the elder, the lad who came over from Paris to Southampton with his Huguenot father. The Chamberlen forceps is sometimes spoken of as *tongs*—by Smellie among others—and no name could more exactly describe it. One can fancy Peter Chamberlen coming in from an impacted labour where he had failed to turn, had vainly tried to get his fingers round the head and had at last been obliged reluctantly to perforate, and as he took up the small hand tongs to put a lump of coal on the fire he might say to himself, "If I could only have grasped the child's head with this, it might have been living now." His tongs made entirely of metal, with their looped handles and scissors-joint, are specialised from coal-vase



FIG. 5.—CHAMBERLEN'S FORCEPS WITH LOOPED HANDLES AND TAPE INSTEAD OF PIN IN JOINT APERTURES (FROM AVELING).

tongs simply in having their blades widened and fenestrated for better grasping of the foetal head, whilst the pin of the joint is rivetted only into one of the shanks so as to allow of their separate introduction into the vaginal cavity. If the blade with the joint-pin was first introduced the other blade with the joint-perforation would be adapted to it by getting the pin to fit into the orifice. Such is the construction of the largest of the three types of forceps found in the Chamberlen chest. The adaptation of pin to perforation may sometimes have been attended with difficulty. That would lead to the construction of the two pairs nearly of the same pattern (Fig. 5) from which the pin is entirely removed. In these the two halves are held together with a braided cord, having a knot at one end and a tag at the other which was found passed through the pinless perforations of the joint. The third variety of forceps used by the Chamberlens is of different

construction (Fig. 6). The joint is formed at the lower end of the left blade, the fenestrum of which remains open to embrace the shank of the right and is secured by a pin passed through the free end of the left blade and the shank of the right, and capable of being screwed into a perforation at the corresponding spot on the left shank. In this pattern there is a notable change in the handles. Instead of terminating in loops they terminate in hooks turned outwards. Now, although Dr Aveling regards this as the earliest of all their forceps, I am rather disposed to look on it as a later development. We do not know what was the latest form the forceps took on in the hands of this ingenious family. But Dr Hugh referred to them as hooks, and although it has been suggested that that "slim" gentleman purposely used the expression to mislead his readers,



FIG. 6.—CHAMBERLEN'S FORCEPS WITH HOOKED HANDLES AND SCREW-PIN IN JOINT (FROM AVELING).

I rather think he was justified in the use of it. The likelihood is that they had actually come to use an instrument "contrived a double debt to pay"—to be used in general as a forceps, whilst in some cases of pelvic presentation or of head perforation the operator could use the curved handle of one or other of the blades as a blunt hook. Certainly when forceps first came to the light of day in the time of Drinkwater, Chapman and Giffard, the handles terminated in hooks turning sometimes outwards, sometimes inwards; and as regards the joint, Chapman tells that at first he used a screw pin to fix the blades, but that eventually he dispensed with the pin and fixed the sides by grasping them at the joint with one hand whilst he made traction with the other. The forceps which he figured in his second edition is of this construction. A forceps of somewhat similar pattern but having a different kind of lock may well have been the instrument employed by Dr Walker, the last

survivor of Dr Peter Chamberlen's obstetric progeny (Fig. 7). For William Douglas avers that this "Dr Walker pretended to improve Dr Chamberlen's forceps, but in truth spoiled them, by making them male and female." When Smellie came to apply his mind to the construction of the forceps he adopted and improved this kind of joint which has ever since been known by his name. As we part from the last of the gifted race, let me say that in having quoted De la Motte, I do not wish to be supposed to say "Amen" to his doom on them for keeping their secret to themselves. As Aveling reminds us,

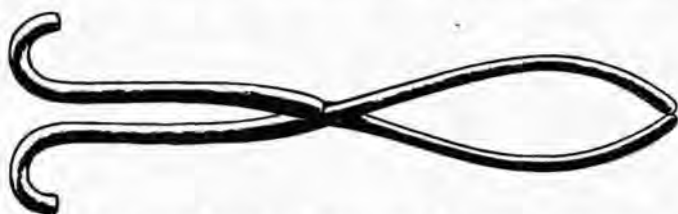


FIG. 7.—DR WALKER'S FORCEPS. FROM A PAIR IN EDINBURGH OBSTETRICAL MUSEUM.

various nostrums and secret remedies were in their days regarded as lawful sources of individual and family income; and indeed the altruism of the race is not yet so far developed as to have restrained a cutler who has recently modified the handles of the axis-traction forceps from taking out a patent for his design.

Minor Modifications of Forceps.

The forceps that emerged from their obscurity in the beginning of the eighteenth century have undergone two important changes. There are infinite modifications in minor directions. The Smellie Lock has almost completely replaced the Joint of the Chamberlen forceps in British practice, though that has been retained in modified forms in French forceps, whilst in Germany the Brunninghausen lock is preferred. This last was adopted by Dr Aveling in his forceps, and by Sir James Simpson in his cranioclast, as it is easily adjusted and holds securely—a notch in the right blade fitting over the stem of a button on the left. Again, whilst the French retain the

iron handles terminating in hooks, Smellie's followers and fellow-countrymen have had the handles shortened and made of wood, and in Germany, though the handles are of wood, they are furnished with traction hooks placed close to the lock. There are diversities also in the blades, which are sometimes non-fenestrated, or have the fenestra larger or smaller with broader or narrower rims, greater or lesser curves abutting immediately on the locks or separated from them by shanks of varying lengths. There were even some invented of entirely different construction, like the ingenious but very unserviceable forceps working like a lobster's claw, contrived by Smellie's contemporary and critic, Dr Burton of York. Burton is well known to have been the original of Sterne's Dr Slop, and when you look at his instrument you understand how, when he put his hand into his green baize bag for his forceps, he made the mistake of pulling out along with it, to the great amazement of Uncle Toby, the syringe which made that bachelor exclaim, "Good God! are children brought into the world with a squirt?"

The Chamberlen Curve.

But whatever minor variations there were in the blades, handles, or lock, the primitive forceps had only the one curve for adaptation of the blades around the foetal head which is found in the Chamberlen forceps. Viewed from the side all these single-curved forceps are straight from the tip of the blades to the handle-ends. They are only capable of application to a head arrested near the parturient outlet. Our obstetrical forefathers who used them were men of boundless patience. They waited for hours after a head was lodged on the pelvic floor to see if what Johnson calls "a secondary labour" would not set in to complete its expulsion, before they thought of putting on forceps. They feared to shock the patient with the idea of an instrument, and Smellie tells how he pinned the upper sheet over his shoulders so that the forceps could be introduced under it without being seen. That they might make no noise he covered them with leather. He even sent a letter once to Professor Munro of Edinburgh along with a pair of wooden forceps which he had employed in three

cases. A small pair of forceps (Fig. 8) made of boxwood which have been in the Edinburgh Obstetrical Museum all this century are probably the identical pair. But while these straight forceps were available for extraction of a head lying on the perineum, they were found insufficient for cases where the head was arrested in a higher plane. Enlarging of the whole instrument, or elongation of the shanks, might allow the blades to pass further into the canals. But because the canals



FIG. 8.—SMELLIE'S WOODEN FORCEPS.

are curved the head was caught only at the side next the sacrum and the forceps slipped; or if the points of the blades were carried forward to conform to the axis of the brim, the perineum was strained and torn. To adapt the blades to a curved canal they must have a pelvic curve.

The Leuret Curve.

In 1754 Benjamin Pugh, surgeon at Chelmsford, published *A Treatise of Midwifery* with a plate of a well-curved forceps, in the preface to which he says: "The Curved forceps I invented upwards of fourteen years ago, made me by a man of Mr Archer's, Cutler, now living in Chelmsford. The preference between them and the common straight forceps, in every respect, is great." And in the body of his work he says they "are adapted in such a manner to the make of the passage that they can with ease be introduced into the body of the womb." Smellie also recognised the advantage of a pelvic curve and in the preface to his second volume, published in 1754, he says: "In my first volume, among the improvements and alterations that have been made in the forceps, I mentioned a long pair, curved to one side, which I contrived several years ago, for taking a firmer hold of the head in the pelvis when high; but I did not recommend the use of them, because

I was afraid of encouraging young practitioners to exert too great force, and to give their assistance too soon."

Before either Pugh or Smellie had published the account of their double-curved forceps, Levret in Paris had recognised the imperfections of the straight instrument. In January 1747, he presented to the Royal Academy of Surgery of Paris a new curved forceps, contrived for disengaging the foetal head impacted in the pelvis and arrested at the brim, and in 1751 he gave to the world a full description and discussion of their value in a volume entitled, "*Suite des Observations sur les Causes et les Accidens de plusieurs Accouchemens laborieux avec des Remarques sur ce qui a été proposé ou mis en usage pour les terminer ; et de nouveaux moyens pour y parvenir plus aisément.*" In this he demonstrates with perfect lucidity the defects of straight forceps—their inability to reach the head in the higher planes, their imperfect grasp of the head, their tendency to slip, their endangerment of the perineum. He shows how with the new curved forceps the head can be securely grasped even above the brim and safely extracted from any part of the parturient canal. He gives full instruction for the introduction and working of the instrument and especially as to the directions in which traction should be made. He says it is not only the most advantageous for the case for which he first designed it. "I dare even to maintain," he adds, "without fear of hazarding too much, for I am in a condition to prove it, that it is preferable in every respect to the straight forceps, even in the conditions most favourable for the latter." He was thus the first to publish a work on forceps with pelvic curve, and it was not only by his writings that Levret told upon the men of his time. Like Smellie, he was a great teacher, and not alone from all parts of his own country but from other lands pupils were attracted to his lectures, so that through them the employment of the forceps with the "new curve," as it was called, was at once widely extended. There was long controversy as to the superiority of the curved (called French) or straight (called English) forceps ; but in the end it became clear that the introduction of a pelvic curve added mightily to the power and usefulness of the instrument. The curve of Levret marks the first cardinal stage in the evolution of the midwifery forceps.

The Perineal Curve.

In 1769 Dr Robert Wallace Johnson, who had been a pupil of Smellie, published in London "A New System of Midwifery." He described and figured a forceps (Fig. 9) at the construction of which he had arrived after a series of experiments with instruments of other patterns. He had not heard of Pugh's forceps till in 1764 he was introduced to them by a cutler in Lombard Street, to whom he had gone to get his



FIG. 9.—WALLACE JOHNSON'S FORCEPS, WITH PELVIC AND PERINEAL CURVE.

own instruments made. He saw that Pugh's embodied some of his own ideas and says, "they appear to me preferable to any of those which were published before them." As to his own, he tells us, "In the execution, my intentions were, *firstly*, that the large curves should correspond as nearly as possible with that of the pelvis; *secondly*, that their points should be thrown forwards, and made round, to prevent their hitching, or even pressing uneasily against any part of the pelvis, and likewise to maintain their hold of the head, whilst it is to be brought forward in that curved line of direction which nature observes;



FIG. 10.—YOUNG'S FORCEPS, WITH PELVIC AND PERINEAL CURVE.

thirdly, that an inverted curve should be made towards the joints, whereby the perineum may be saved from injury, the extracting force rightly conducted, and the handles, at the same time, kept from pressing uneasily on the inferior and anterior parts of the pubes." This is the earliest notice of the "inverted curve" which has sometimes been called "perineal curve," with which various practitioners about the same epoch had their forceps made. The forceps (Fig. 10) used by my predecessor, Professor Young, who held the Chair of Midwifery in the

Edinburgh University from 1756 to 1780, has this perineal curve. An octavo set of Smellie's Anatomical Tables published in Edinburgh in 1792, has an "additional table No. XL," showing "improvements which have been made in the obstetrical apparatus since the days of Dr Smellie." The forceps delineated is of this type, and the description is taken verbatim, but without acknowledgment, from Johnson. Dr Aitken, also of Edinburgh, who contrived various modifications of the forceps, and Dr Evans of Oswestry, had forceps made with a perineal curve; and most notable of all, Mulder, in his *Historia litteraria et Critica Forcipium* in 1792, after careful study of all the varieties of forceps, comes to the conclusion, that the properly constructed forceps should have not



FIG. 11.—MULDER'S IDEAL FORCEPS.

only a cranial and a pelvic curve, but should be recurved near the lock, so that, as he figures (Fig. 11) in his plate of the ideal forceps, a line passing through the chord of the curve of the blades runs down through the extremity of the handles.

Imperfections of Double-curved Forceps.

It seems strange that the next clear step, therefore, in the evolution of the forceps was not already taken in the century during which so many minds and hands were at work on their improvement. But for some generations there was entertained a certain timidity in the use of the forceps. It was thought necessary to apologise for their employment. There was a tendency to secrecy in their application, and it was largely the short straight forceps, or small forceps with imperfect curves, that were made use of. Quite up to the middle of the nineteenth century even the practitioners who advocated the value of the double-curved forceps were apt to reserve their use for what were called "high forceps cases" and to content themselves with the straight instrument in the "low forceps cases"—and after all, these were the more frequent—where the head

was easily accessible. One result was that the value of the instrument was not fully appreciated, and the sphere of its application was painfully restricted. In the great Obstetrical School of Dublin, *e.g.*, Dr Clarke, master of the Rotunda Hospital, declared that he would rather cut off his right hand than apply forceps in a primipara, and when Dr Beattie adduced statistics in favour of the use of the forceps in labour, Dr Clarke replied by sending him a challenge to fight a duel.

It was not till after anæsthesia began to give the obstetrician greater freedom in the use of instruments that the full value of

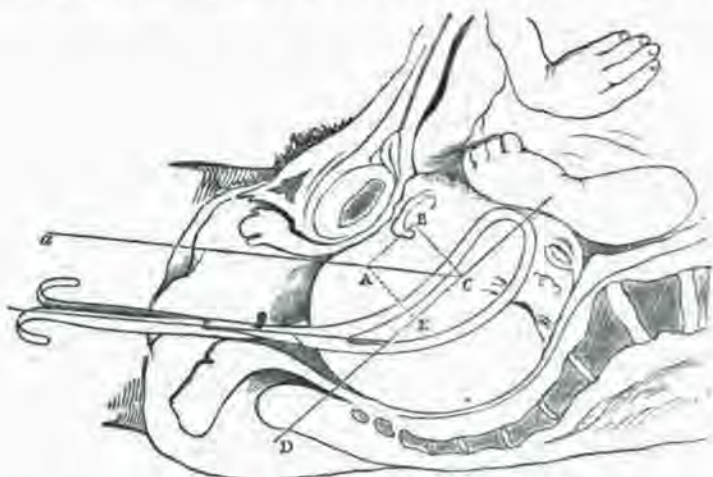


FIG. 12.—LEVRET'S CURVED FORCEPS APPLIED TO HEAD IN PELVIC CANAL.

the long double-curved forceps came to be more fully recognised, and with the more frequent use there grew up a clearer idea of its imperfection as a tractor. In various schools it began to be seen that to get its full benefit it must be made not with a mere perineal curve but with a full compensation curve. There is a double fault in forceps with the Levret curve, because in making traction with them there is both loss of power and misdirection of force. Let us suppose traction is being made through the hooks of the Levret forceps represented in this diagram (Fig. 12) as applied to the head of the child in one of Braune's frozen sections. The central point of the head C ought to travel downwards in the direction of the line C D, along which it would be driven

by the natural parturient powers. But traction applied simply through the hooks *a* will act in the direction of the line *a A C* running parallel to the handles. Only a part of the power thus applied is available for dragging the head through the pelvis in the axis of the brim. If we resolve the force into its components, we find these constituted by the lines *C E* and *C B*. Of these the useful component *C E* in a case where a force *A C* of the weight of 50 lbs. meets the line of descent *C D* at an angle of 40° will be only $38\frac{1}{2}$ lbs. There is a loss of $11\frac{1}{2}$ lbs. And it is important to observe that whilst a force of only $38\frac{1}{2}$ lbs. is acting in a useful direction a force of 32 lbs. is being exerted in a vicious direction, crushing the head against the symphysis in the direction and to the extent indicated by the line *C B*, and tending to cause the forceps to slide off the head. As the actual line of traction diverges further from the axial one, the amount of this detrimental pressure rapidly increases. Supposing the traction force is 50 lbs., if the line of traction meet the pelvic axis at an angle of 10° the detrimental pressure is 8.68 lbs; if at an angle of 30° , it is 25 lbs.; and if the angle be as much as 50° the detrimental pressure would be 38.30 lbs., while the available force would be reduced to 32.13 lbs.

Obstetricians had in various ways sought to overcome these drawbacks, as by tapes passed through the fenestral rims, or by instruments for pressing or pulling back the shanks while traction was made through the handles. For the most part they contented themselves with using the two hands simultaneously applied to the handles and to the neighbourhood of the lock or to the shanks, so that while one hand pulled the head downwards the other pressed it in a direction backward towards the hollow of the sacrum.

Steps towards Improvement.

Hubert, of Louvain, was the first clearly to demonstrate the disadvantages of the double-curved forceps. In 1860 he proposed to remedy their defect by having the free extremities of the handles bent back at a right angle, and in 1866 (Fig. 13), by fixing a bar to the handles close to the lock, through which traction could be made directly in the line of the chord of

the blade curve. In 1868 Dr Aveling laid before the London Obstetrical Society a pair of forceps the handles of which were recurved, so that viewed from the side, the instrument is seen to have a sigmoid shape; and in 1878 in a very able and interesting communication, he discussed the curves of midwifery forceps and demonstrated the advantages of an instrument made with what he called the "handle curve." In using his instrument he intended that the operator, while grasping the handles with one hand to keep them together, should make traction by pulling only through the extremity of the handles.

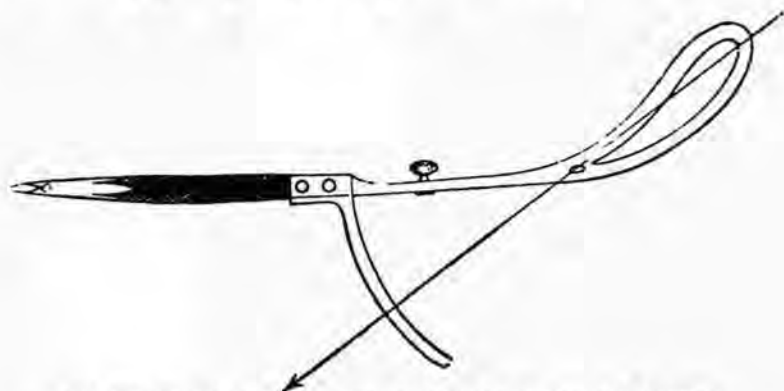


FIG. 13.—HUBERT'S FORCEPS, WITH COMPENSATORY TRACTION HANDLES.

Still the value of the compensation curve was not appreciated by the profession until a forceps was constructed easy of introduction, and giving the operator not only the power of axis-traction but a guide to the direction in which to pull. Paris, that saw the birth of Pierre Chamberlen, the inventor of the forceps with the cephalic curve, and that saw the establishment of the pelvic curve in the hands of André Levret, witnessed also the next important stage in the evolution of the compensation curve.

The Tarnier Axis-traction Forceps.

Etienne Stephane Tarnier was born in 1828 at Aiserey, near Dijon, where his father was the village doctor, and died in Paris in 1897, after a career of rare brilliance and beneficence. He made many improvements in our ways of dealing

with the troubles of pregnancy, parturition and the puerperium, and left behind him a noble school of younger obstetricians, inspired by his example and well trained to carry on the work of their beloved master. We owe to him our knowledge of the importance of the milk treatment of gravidic albuminuria. His name stands high, if not highest, among those who have worked for the lessening of puerperal mortality by his writings on aseptic midwifery and by his introduction of corrosive sublimate as the most powerful antiseptic. On various operative procedures he has made his mark, as, *e.g.*, in his substitution of the basiotribe for the cephalotribe. But above all else his name will ever be associated with the change that he effected in the construction of the forceps. It was in 1877 that he published the Memoir in which he demonstrated the necessity of the compensation curve and the possibility of obtaining the full



FIG. 14.—TARNIER'S "NEW FORCEPS."

value of it by means of curved rods jointed to the blades and pulled on by a traction-bar attached to their free extremities. A forceps so constructed is, of course, more complicated than the ordinary double-curved instrument. The handles that in the old instrument are used, first for application, and then for prehension and then for extraction, serve in the Tarnier instrument only for manipulation during the introduction of the blades. They are now simply the "Application-handles." After the blades have grasped the head they are kept in place by means of a fixation-screw placed just below the lock which serves to keep the handles in apposition. The application-handles are not touched after the adjustment has been effected. As the foetal head descends in the grasp of the blades through the medium of the traction-handle or traction-bar with the jointed rods, the application-handles are free to descend in advance of the foetal head and turn forward as the head moves round in the circle of Carus. This change

in the direction of the application-handles gives a constant guide to the direction in which at any moment traction should be made to ensure the onward progress of the head. The forceps (Fig. 14) which Tarnier recommended in his Memoir seemed to me, like French forceps in general, unnecessarily large and, further, unnecessarily complicated by having a perineal curve on the shanks. In 1880 I advocated the employment of forceps (Fig. 15) constructed on Tarnier's principle, and showed that the recurved rods with their traction-bar could be jointed to the best type of British forceps

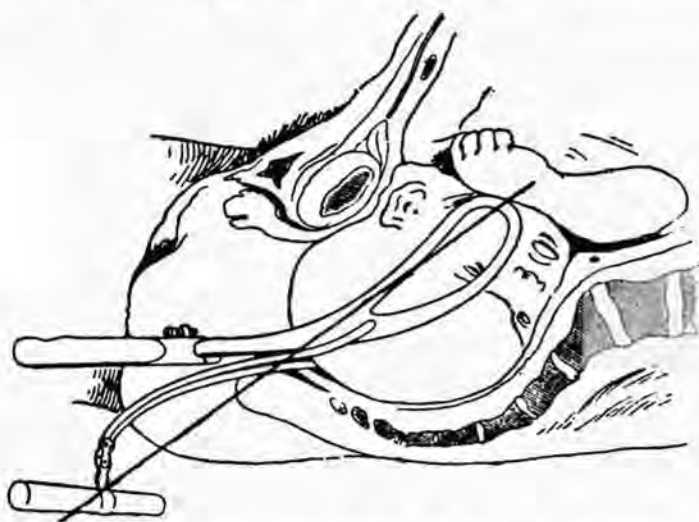


FIG. 15.—A. R. SIMPSON'S AXIS-TRACTION FORCEPS APPLIED TO HEAD IN PELVIC CANAL.

with the most satisfactory results; and at a later period Tarnier also had his forceps made with only a pelvic curve on the blades and a compensation curve on the jointed rods.

Possible Improvements and Assured Advantages.

There may be room for minor variations in all parts of these, just as we saw that there were many minor variations in the different parts of the single double-curved forceps. The rods that were at first permanently attached to the blades may be made capable of separation for purposes of easier package or

more thorough sterilisation. The methods of adaptation of the traction-handle to the rods may vary. The fixation-screw may be of different size or in a different position. But the essential in what I have designated "Axis-traction Forceps" is that traction be made through rods jointed to the blades below their fenestra and having such a compensation curve that a straight line may run from the tips of the blades to the traction-bar at the other end of the rods. The experience of more than twenty years has shown with growing emphasis the value of Tarnier's traction-rods, and the advantages claimed for them at the first still holds good:—

1. All the force expended by the operator is useful. He wastes no energy in compressing or keeping the handles together while he pulls, and none of the pulling power is lost.

2. There is no unnecessary and injurious pressure produced on the maternal structures. The head is made to advance under the pull of this artificial *vis a fronte* in the very same direction as it would move under the impulse of the natural *vis a tergo*.

3. The head not being dragged by the forceps against the symphysis pubis, is not so likely to elude their-grasp.

4. The transverse traction-handle gives a solid grasp and purchase for pulling by, and, in consequence of its power of moving in all directions, may be made to run parallel to the axis of the instrument at the close of the labour. It can be used in repressing the too rapid advance of the head where it is advisable to save the perineum from the risk of too rapid expulsion of the head.

5. The compression of the head in one direction, and the compensatory elongation in another, are not increased during tractions made through traction-rods, as they do when traction is made through the ordinary handles. The compression and moulding is altogether a closer copy of the natural configuration than is produced by the old forceps.

6. The rotation of the head is not resisted in any degree, and in the rare cases where it requires to be favoured or effected, the rectification of the position can be brought about by one hand grasping the application handles, while the other makes traction through the rods.

7. The direction of the application handles furnishes a

constant guide to the direction in which traction can be made with most effect. This is the most important advantage of the adaptation of jointed traction-rods to the forceps blades, and is of itself, to my thinking, enough to make it supersede the use of all the instruments that have perineal and handle-curves. To avail ourselves of it, it is simply necessary to keep the traction-rods constantly parallel to the shanks of the blades; and the proper line of traction is thus kept up whether the head be passing through brim, cavity, outlet, or vulva.

The complacency with which some of the forceps-improvers of the eighteenth century speak of their implement as now perfect, warns us against the danger of speaking as if we have attained finality. We do better to follow the example of Levret, of whom a contemporary said, "He confesses himself (for the encouragement of others) but little advanced on the way to excellence: from the stage he halts at, he would have others start for the goal of excellence." Of one thing, however, I am sure, that if a practitioner accustomed only to the use of the old double-curved forceps will use the axis-traction forceps in one or two difficult cases, he will find that they work with so much safety to the mother and child, and with so much ease to himself that he will ever after use them in every case. There is no case high or low, with presentation and position normal or abnormal, demanding forceps delivery where the axis-traction instrument may not be applied. Since it came into use the range of forceps application has been greatly widened, and the sphere of the competing operations, such as Turning, Embryotomy and Induction of Premature Labour has been correspondingly narrowed.

Frequency of Forceps Cases.

How frequently forceps are to be used in practice might be discussed at much length, and in the end the question would be determined by the personal equation. When I was Secretary to our Edinburgh Obstetrical Society some forty years ago we had a royal night when Dr Hamilton of Falkirk argued that labours ought often to be terminated by forceps, and stated that in his last 731 consecutive labours the children had all been born alive and every seventh

or eighth child had been brought into the world with forceps. Dr Figg, who practised in the contiguous parish of Borrowstouness, agreed as to the propriety of the speedy termination of labours, but his favourite method of interference was by turning. His patients attributed the speed with which he helped them through their trouble to the chloroform with which he indulged them. They would ask for "the stuff" as they expressed it, and whilst they were asleep he found it growingly easy to pass his hand into the uterus so as to lay hold of one of the limbs of the child and turn and pull it out. He was almost disposed to think that if nature had known that there was to be a skilled obstetrician at a parturient woman's bedside she would have made all the presentations pelvic, to save the necessity of the operator's hand going far through the cervix uteri. He had, like Dr Hamilton, an unusual series of deliveries effected in this way without any attendant danger or mortality. "The last ripe fruit from my own Figg-tree," he said, "was plucked in this fashion."

There was excess of interference on the part of both of these practitioners, especially in the practice of our Bo'ness brother. Still it is easy to understand that a man who has become familiar with the manipulation of an instrument that he knows to be safe in its application to mother and child, will feel justified in using it to save his own time as well as his patient's suffering, in a case where another man would for a longer time wait and watch the natural efforts.

Gideon Gray's Warning.

The life-like portrait of Gideon Gray might have been sketched from the character of Dr Thomas Anderson of Selkirk, near neighbour and friend of Sir Walter Scott. I once met at Abbotsford his son, Dr Henry, who died at an advanced age eleven years ago, and he told me that one day as his father and he were setting out on a long round of some fifty or sixty miles with the possibility of Henry being left in attendance on a shepherd's wife the father asked, "What's that ye're pittin' i' the gig, laddie?"

"It's the forceps."

"Did ye say your prayers this morning?"

"Yes, why do you ask that?"

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"Why? My man! Because it's nae guid praying 'Lead us not into temptation,' if ye tak' forceps wi' ye tae a midwifery case."

The old doctor had a measure of right. Even this noblest of instruments may be abused; and as we carry it in our obstetric bag we may do well to say to ourselves what Gideon Gray said to the impatient father of Xilias de Monçada's child, "Nature must not be hurried, and she avenges herself of any attempt to do so." The best effects of the forceps are secured when we use them, not as a substitute for the efforts of nature, but as an aid where these are like to fail.