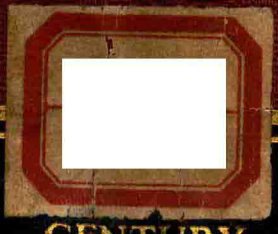
TEXTBOOK OF OBSTETRICS

STANDER



CENTURY

TEXTBOOK OF OBSTETRICS

DESIGNED FOR THE USE OF STUDENTS AND PRACTITIONERS

BY

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STANDER'S THIRD REVISION

This Edition represents the Ninth Edition of *Williams Obstetrics,* the first six of which were written by the late Dr. J. Whitridge Williams, Professor of Obstetrics, Johns Hopkins University School of Medicine; Obstetrician-in-Chief to the Johns Hopkins Hospital, Baltimore, Maryland

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TEXTBOOK OF OBSTETRICS

PREFACE

In this textbook, designed for the use of both the medical student and the practitioner, I have attempted to present the science and art of obstetrics as taught in the Cornell University Medical College and practised in the New York Lying-In-Hospital. Scientific and clinical data are given throughout the text, as these must of necessity be part of an academic as well as adequate presentation of the subject matter. The great majority of the teachers of obstetrics asked me to follow this plan, while only a few advised "stream-lining". For those who wish to concentrate in their teaching and reading on the more practical aspects, these are in larger type, while the historical and a great deal of the theoretical considerations appear in small type.

It is also partly on the advice of my colleagues and teachers of obstetrics, many of them trained by Williams, that a change has been made in the title-page. This edition presents the Ninth Edition of Williams' Obstetrics, but as it embodies the teaching and practice of the present author, he should assume full responsibility and thus this change in title is indicated. As stated in my first revision, the textbook, written in 1903 and revised through six editions by J. Whitridge Williams, was the standard work in obstetrics during that whole period. The reception accorded my previous revisions of this work by teachers and practitioners in this country as well as in several foreign countries leads me to hope that the present textbook will occupy a similar place in the teaching and practice of the obstetrical art.

The general plan of this book is different from the previous editions of Williams' Obstetrics. To facilitate revisions when indicated, the subject is presented in Sections and subheadings, instead of Chapters. As some medical schools teach only clinical pelvimetry and clinical or etiological classifications of contracted pelves, while others limit their instruction to morphological classifications based on X-ray pelvimetry, these topics have been presented in separate subsections. However, the utilization of both clinical and X-ray pelvimetry and classification, as practised in our clinic, is fully discussed. As a result there should be no confusion to either the teacher or the practitioner who wishes to utilize one or other, or both of these approaches to the subject of Abnormal Pelves.

The sections on the causes of maternal and fetal mortalities give the most recent statistics, present the factors responsible for the noteworthy reduction in the former and indicate the efforts required to bring about a comparable decrease in premature, full-term and neonatal deaths.

Therapy in the various infectious diseases and conditions complicating gestation, as well as in puerperal infection is brought up to date and in line with the recent advances in our knowledge of the sulfonamide drugs and penicillin. On the other hand, equal, if not greater, emphasis is placed on adequate antenatal care, prevention and prophylactic treatment.

To a large number of colleagues do I wish to express my thanks for valuable suggestions and material for illustrations. as indicated in many of the captions.

My associates, R. Gordon Douglas, A. A. Marchetti and Charles M. McLane have been of help in the preparation of material for certain sections; W. B. Stromme, Robert E. Bennett and William F. Finn in the organization of certain essential data and assisting in photography, proofreading and indexing; while Wilbur M. Dixon aided in proofreading. The statistical data from the records of our hospital have been prepared by Dr. Katherine Kuder. Miss Elizabeth Brödel has imparted to the book an artistic feature, at once evident and of the highest excellence. In this she has been assisted by Mrs. Jeanet Dreskin. My secretary, Miss Dorothy E. Beaton, has helped me throughout the arduous task of abstracting the literature and preparing the manuscript. Without her assistance the completion of this work would have been an almost impossible task.

As in the past, it gives me pleasure to express my gratitude to D. Appleton-Century Company which gave me a completely free hand in all matters, including illustrations.

I sincerely hope that this book, like its predecessor, will remain the standard text in the American and Canadian medical schools, and in its several translations in many of the foreign countries.

H. J. STANDER

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TEXTBOOK OF OBSTETRICS

ANATOMY

THE FEMALE ORGANS OF REPRODUCTION

Obstetrics (from the Latin *obstare*—to stand before) is that branch of medicine dealing with the function of reproduction. Thus the care of the pregnant woman and her offspring during the period of gestation, parturition and puerperium constitutes the practice of obstetrics (midwifery, tocology). Gynecology, (*γυνή*, a woman; *λόγος*, discourse) is closely related to obstetrics in that it deals with the diseases of women, including many conditions resulting from childbirth.

The female organs of reproduction are divided into two groups—the external and the internal. The external organs, together with the vagina, serve more especially for copulation, while the internal organs are directly concerned with the development and birth of the fetus.

THE EXTERNAL GENERATIVE ORGANS

The term pudendum is occasionally applied to the external organs of generation, although the more common designation is the *vulva*. This includes everything which is visible externally from the lower margin of the pubis to the perineum—namely, the mons veneris, the labia majora and minora, the clitoris, vestibule, hymen, urethral opening, and various glandular and vascular structures.

Mons Veneris.—The mons veneris is the name given to the fatty cushion which rests upon the anterior surface of the symphysis pubis. After puberty the skin over it is covered by a growth of crinkly hair, which is sometimes described as the "*escutcheon.*" Generally speaking, the distribution of the pubic hairs differs considerably in the two sexes. In the female they occupy a triangular area whose base corresponds to the upper margin of the symphysis, while a few hairs extend down over the outer surface of the labia majora. In the male, on the other hand, the escutcheon is not so circumscribed, as the hairs composing it extend triangularly upward toward the umbilicus and downward over the inner surface of the thighs. These differences were described in detail by Ploss, and at one time it was believed that they might be of value in determining the sex in doubtful cases. They are, however, not altogether characteristic, the female escutcheon, considered a secondary sex characteristic, not infrequently approaching the male type.

Vulva.—In the restricted sense, the term vulva (from the Latin *valva,* a folding door), or rima pudendi, is applied only to the structures lying beneath the mons veneris. Its position varies according to the inclination of the pelvis, but it usually runs horizontally when the woman is in the erect position. It presents marked individual variations in appearance, but its most noteworthy differences are dependent upon the age of the person and whether or not she has borne children.

Labia Majora.—On either side of the vulva extends a rounded mass of tissue, the labium majus. The labia majora vary in appearance, according to the amount of fat beneath them. They are less prominent after childbearing, and in old age usually assume a shriveled appearance. Ordinarily they measure 7 to 8 centimeters in length, 2 to 3 centimeters in width, and 1 to 1.5 centimeters in thickness. They are somewhat lozenge-shaped, and become narrower at their lower extremities. In children and virginal adults they usually lie in close apposition and completely conceal the underlying parts, whereas in multiparous women they often gape widely. They are directly continuous with the mons veneris above, and fade away into the perineum posteriorly, although in some instances the posterior portions of the labia majora join together to form a transverse fold, the *posterior commissure,* situated directly in front of the fourchet.

Each labium majus presents two surfaces, an outer and an inner. The outer surface corresponds in structure to the adjacent skin, and after the age of puberty is more or less thickly covered with hair. In women who have never borne children the inner surface is moist and resembles a mucous membrane in appearance; whereas in multiparae it becomes more skinlike, but is not covered with hair. It is richly supplied with sebaceous glands. Beneath the skin there is a layer of dense connective tissue, which is rich in elastic fibers and adipose tissue, but does not contain muscular elements. Beneath this layer, which corresponds to the tunica dartos of the scrotum, is a tolerably dense mass of fat, to which the labium owes the greater part of its size. This fatty tissue is supplied with an abundant plexus of veins, which may rupture as the result of external violence or injury sustained during labor, and give rise to an extravasation of blood or hematoma.

The labia majora are analogous to the scrotum in the male, and at their upper ends receive the termination of the round ligaments. Exceptionally one or both of the inguinal canals, which in the female are designated as the canals of Nuck, may remain patent, so that in rare instances there results a hernial sac which usually contains intestine, but occasionally the tube or ovary, and possibly even the uterus.

Labia Minora.—On spreading apart the labia majora two triangular structures are seen, which meet together at the uppermost portion of the vulva. These are the labia minora or *nymphae,* so-called because they were supposed to direct the course of the urine. They vary greatly in size and shape, and in nulliparous women are usually hidden by the labia majora. In multiparae, on the other hand, they project beyond them.

Each labium minus consists of a thin fold of tissue, which when protected presents a moist, reddish appearance, similar to that of a mucous membrane. It is, however, covered by stratified epithelium, into which project numerous papillae. It has no hairs upon it, but contains many sebaceous follicles and occasionally a few sweat glands. The interior of the labial folds is made up of connective tissue, in which are many vessels and a few nonstriated muscular fibers, so that they are classed among the erectile structures. They are extremely sensitive, and are abundantly supplied with the several varieties of terminal nerve endings, as has been shown by the work of Krause, Carrard, and Webster.

The labia minora converge anteriorly, each dividing toward its upper extremity into two lamellae. Of these the two lower fuse together and form the *frenulum clitoridis,* while the upper ones make the *preputium.* Posteriorly they either pass almost

imperceptibly into the labia majora or approach the middle line as low ridges, which fuse together and form the *frenulum labiorum pudendi* or *fourchet*.

According to Nagel, the labia minora are homologous with the skin upon the under surface of the penis. They frequently become considerably hypertrophied, either from unknown causes or as a result of masturbation. Among the Hottentots they assume immense proportions, and project from the vulva in the form of an apron some centimeters long. Among certain uncivilized races voluminous labia minora are considered to enhance the beauty of their possessors; and it is generally believed that artificial means are employed to bring about an increase in their size, but Marius Wilson

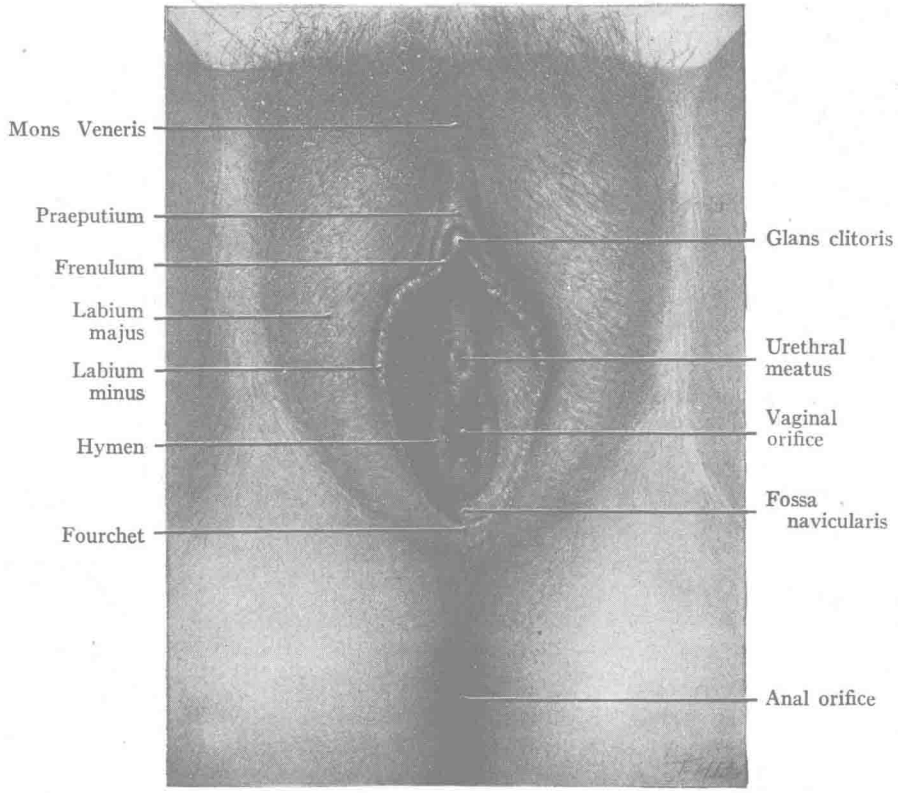

FIG. 1.—THE NORMAL VULVA.

considers that it is the result of natural causes. According to Ploss, the Nubians and many other races practice *infibulation* as part of their religious ceremonial. In this operation, which is performed just before the age of puberty, the edges of the labia are freshened with a knife, and then sutured together in such a manner as to leave an opening only large enough to permit the escape of the menstrual flow. In such circumstances a second operation is necessary before marriage can be consummated.

Clitoris.—The clitoris is situated at the most anterior portion of the vulva, and projects between the branched extremities of the labia minora, which form its prepuce and frenulum. It is the analogue of the penis in the male, from which it differs in not possessing a corpus spongiosum, and in not being perforated by the urethra. It con-

sists of a glans, a corpus, and two crura. According to Temesváry, the glans is made up of spindle-shaped cells, suggesting those of the ovarian stroma; while the corpus contains two corpora cavernosa, in whose walls are nonstriated muscle fibers. The crura are long, narrow structures which arise from the inferior surface of each ischiopubic ramus and fuse together, just below the middle of the pubic arch, to form the body of the clitoris. The clitoris is usually a rudimentary organ and rarely exceeds 2 centimeters in length, even when in a state of erection. It is sharply bent on itself, owing to traction exerted upon it by the labia minora. As a result, its free end looks downward and inward toward the vaginal opening. The glans, which rarely exceeds a small pea in size, is covered by squamous epithelium, is richly supplied with nerve endings, and is extremely sensitive. The entire clitoris is very erectile, and its vessels are connected with the vestibular bulbs by means of the pars intermedia. Figure 9 gives a good idea of the relations of the clitoris, its crura, and the vestibular bulbs. We are indebted to Kobelt for most of our knowledge concerning this organ, and since the appearance of his monograph, in 1844, the clitoris has been regarded as the chief seat of voluptuous sensation.

About the middle of the last century Baker Brown proposed its amputation as a panacea for nearly all the ills to which women are subject, and for a short time the operation of *clitoridectomy* enjoyed a considerable vogue, but has since been completely abandoned. Among many aboriginal races the same operation had been performed from time immemorial as a religious rite—"girl circumcision." Occasionally the clitoris may become so hypertrophied as to resemble the penis, and not a few cases of so-called hermaphroditism, or pseudohermaphroditism, are to be explained by this abnormality.

Vestibule.—The vestibule is the almond-shaped area which is inclosed between the labia minora and extends from the clitoris to the fourchet. It is the remnant of the urogenital sinus of the embryo, and is perforated by four openings—the urethra, the vaginal opening, and the ducts of Bartholin's glands. The posterior portion of the vestibule, between the fourchet and the vaginal opening, is called the *fossa navicularis*. This is rarely observed except in nulliparous women, as it usually becomes obliterated after childbirth.

Vestibular Glands.—In connection with the vestibule, certain glandular structures—the *glandulae vestibulares majores* and *minores*—are usually described. The former are designated as *Bartholin's glands,* or the glands of Duverney, who first described them in the cow. They are two small compound racemose glands, varying from a pea to a small bean in size, and are situated beneath the vestibule, on either side of the vaginal opening. They lie under the constrictor muscle of the vagina, and in a few instances are found to be partially covered by the vestibular bulbs. Their ducts, from 1.5 to 2 centimeters long, open upon the sides of the vestibule just outside the lateral margin of the vaginal orifice. In caliber they are usually small, and the lumen will admit only a bristle. Under the influence of sexual excitement the glands secrete a small amount of yellowish material. The ducts sometimes harbor gonococci, which may gain access to the gland and cause it to suppurate, so that the entire labium becomes distended by a collection of pus.

The glandulae vestibulares minores are a number of small mucous glands which open upon the upper portion of the vestibule. Their orifices are occasionally several millimeters in diameters, and in such cases they are designated as lacunae.

Urethral Opening.—The mouth of the urethra, or urinary meatus, is situated in the middle line of the vestibule, 1 to 1.5 centimeters below the pubic arch and a short distance above the vaginal opening. It usually presents a puckered appearance, and its orifice appears as a vertical slit, which on distention is 4 or 5 millimeters in diameter. The *para-urethral ducts* open upon the vestibule on either side of the urethra, and occasionally upon its posterior wall, just inside its mouth. They are of small caliber, 0.5 millimeter in diameter, of varying length, and in this country are generally known as Skene's ducts. They were, however, described by Malpighi in the seventeenth century. Considerable discussion has arisen as to their origin, and certain observers, notably Kocks, believe that they represent the lower extremities of the wolffian ducts. Most authorities, however, do not share this view, and believe that they are simply exaggerated lacunae.

Vestibular Bulbs.—Lying beneath the mucous membrane of the vestibule, on either side, are the vestibular bulbs. These are almond-shaped, erectile bodies, 3 to 4 centimeters long, 1 to 2 centimeters wide, and 0.5 to 1 centimeter thick. They lie in close apposition to the ischiopubic rami, and are partially covered by the ischiocavernosus and constrictor vaginae muscles. Their lower ends usually terminate about the middle of the vaginal opening, while their anterior extremities extend upward toward the clitoris, where they are united by the pars intermedia through which the blood from them reaches that organ. They were first described by Kobelt, and their vascular connections have been exhaustively studied by Gussenbauer.

Embryologically, they correspond to the corpus spongiosum of the penis. During parturition they are usually pushed up beneath the pubic arch, but, as their posterior ends partially encircle the vagina, they are liable to be injured, and their rupture may give rise to a hematoma of the vulva, or to profuse external hemorrhage if the tissues covering them are torn through.

Vaginal Opening and Hymen.—The vaginal opening occupies the lower portion of the vestibule and varies considerably in size and shape in different individuals. In virgins it is entirely hidden from view by the overlapping labia minora, and, when exposed by folding them back, appears almost completely closed by a membranous structure known as the hymen.

The hymen presents marked differences in shape and consistence. In the newborn child it is a redundant structure which projects considerably beyond the surrounding parts, while in adult virgins it is a membrane of varying thickness which closes the vaginal opening more or less completely, and presents an aperture which varies in size from a pin's point to a caliber which will readily admit the tip of one or even two fingers. The hymenal opening is usually crescentic or circular in shape—*hymen semilunaris* or *annularis*. In rare instances it may assume other forms, which have been studied more particularly by Dohrn and Budin; the most important varieties being the cribriform, septate, and denticulate or fimbriated hymen. Dohrn devoted particular attention to the fimbriated variety, and stated that it might be mistaken by an inexperienced observer for a ruptured hymen, so that this type possesses some medicolegal interest, and one must be cautious when making definite statements as to rupture of the hymen.

The derivation and development of the hymen is better understood since the appearance of Robert Meyer's contributions to the embryology of the human vagina. As a result of his studies, it is believed that the opening of the vagina is a process that

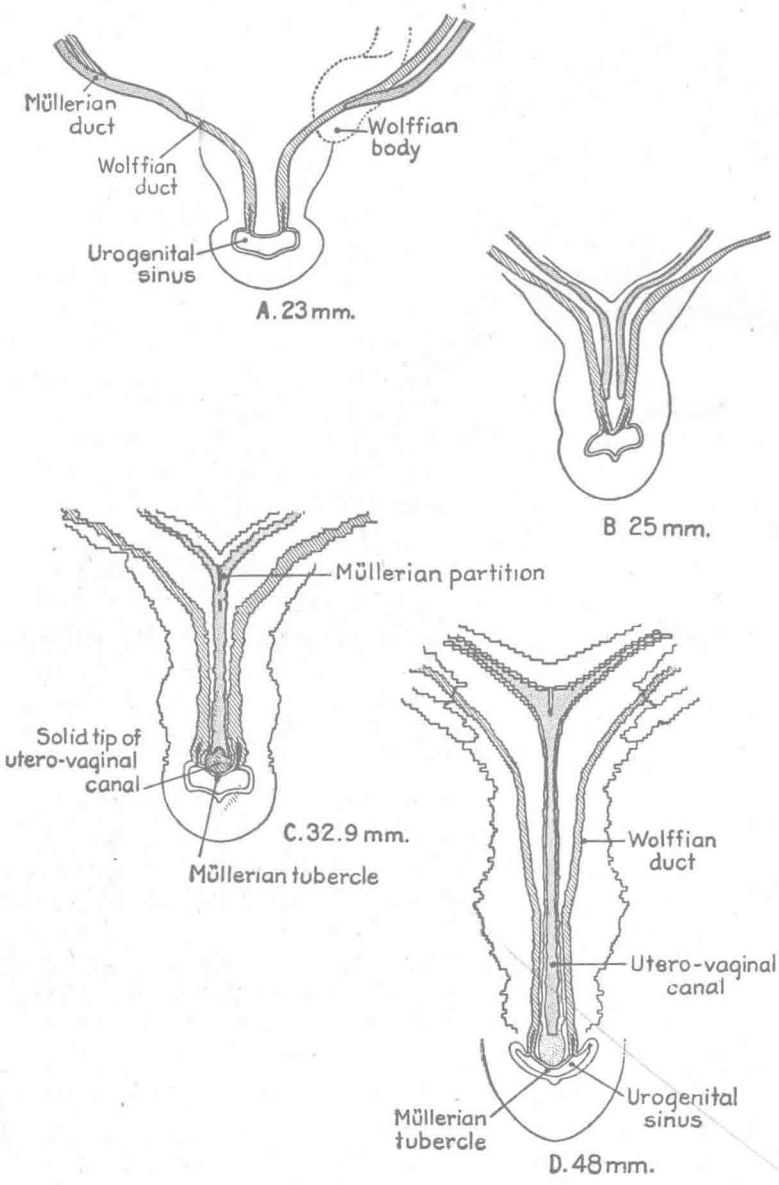

FIG. 2.—DEVELOPMENT OF THE MÜLLERIAN AND WOLFFIAN DUCTS.

Shows at various phases of early embryonic development the relations between the Müllerian and Wolffian Ducts, the fusion of the Müllerian ducts and the development of the utero-vaginal canal which ends blindly and impinges upon the urogenital sinus at the Müllerian tubercle. (From Koff, *Contributions to Embryology,* Carnegie Institution.)

is independent of the formation of the hymen. According to Meyer's concept, then, the development of the hymen may precede or follow the opening of the vagina into the dorsal sinus diverticulum, and since the hymen develops from the wall of the open urogenital sinus, it is an open structure from the very beginning. Therefore, there is no such abnormality as an imperforate hymen. Briefly, the steps in the formation of the hymen are as follows: The lateral segments of the hymen are determined earlier by infoldings of the lateral walls of the urogenital sinus. The posterior segment is formed when the wall of the dorsal diverticulum of the sinus is ironed out by the expansive and caudalward piston-like pressure of the intravaginal content. Thus, the outer layer of the posterior portion of the hymen, as well as part of its connective tissue, is derived from the urogenital sinus or vestibule and the inner layer from the vagina. The anterior or ventral component of the hymen usually is not developed until later. It is dependent upon the expansion of the anterior vaginal wall which flattens out a portion of the urethro-vaginal septum.

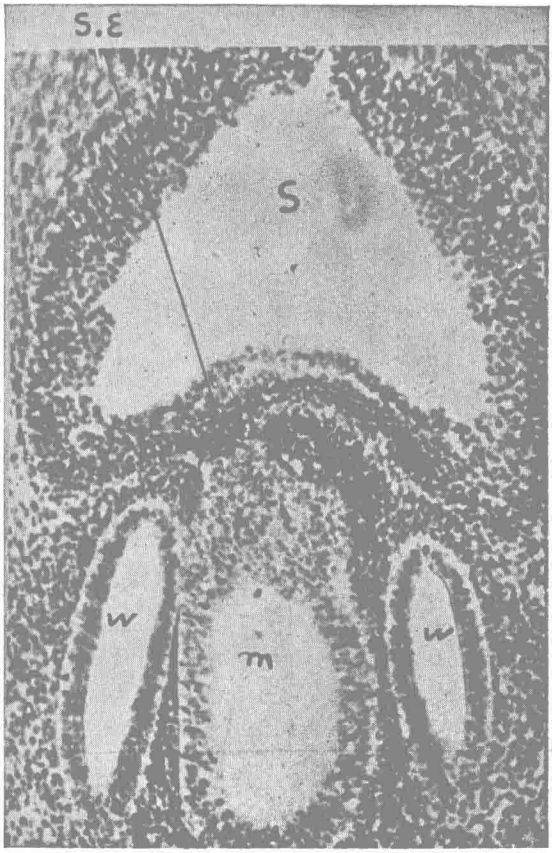

FIG. 3.—EARLY DEVELOPMENT OF THE VAGINA.

Stage (embryo 40 mm.) in the development of the reproductive tract showing the very beginning of the invasion of the müllerian canal by the sinus epithelium. S., urogenital sinus; S.E., sinus epithelium; M., Müllerian canal; W., Wolffian ducts. (From Robert Meyer in Novak, *Textbook of Gynecology*, Williams and Wilkins Co., Baltimore.)

The hymen may vary markedly in consistence in different individuals. According to Dohrn, many types are observed—from a delicate structure resembling a spider's web to a fleshy, ligamentous, or even cartilaginous membrane, which in rare instances has even been described as "bony." In the matter of elasticity, again, wide variations are met with, some hymens being so delicate that they rupture upon the slightest touch, while others still remain unbroken even after considerable distention.

As a general rule the hymen ruptures at the first coitus, tearing at several points, usually in its posterior portion. The edges of the tears soon cicatrize, and the hymen becomes permanently divided into two or three portions, which are separated by narrow slits extending down to its base (Fig. 5). The extent to which rupture occurs varies with the structure of the hymen and the degree to which it is distended, being most marked when it is delicately formed.