CHAPTER VII

INFLAMMATORY AND METABOLIC DISTURBANCES OF THE UTERUS

In addition to inflammation and new growths and displacements of the uterus there are certain organic changes due largely to disturbance in the metabolism of the organ—either from endocrine disorders, as in endometrial hyperplasia, or from defective circulation and allied conditions, as in subinvolution. For convenience, these disturbances of metabolism and the inflammatory disorders are grouped together in this chapter. Laceration of the cervix is placed here also, for its clinical significance, in regard to products or symptoms or need for treatment, is due largely to complicating inflammation. These conditions affecting the uterus will be presented in the following order:

In Cervix Uteri

Acute Cervicitis.
Chronic Cervicitis (including erosion, eversion, laceration, cyst formation, leucoplakia, and sequelae of laceration).
Ulcer of Cervix (simple, chancroidal, syphilitic, tuberculous, etc.).
Polypi of Cervix.
Hypertrophy of Cervix.

In Corpus Uteri

Hyperplasia of Endometrium and Polyp Formation.
Membranous Dysmenorrhea.
Acute Endometritis.
Chronic Endometritis.
Chronic Metritis.
Subinvolution.
Hyperinvolution.
Hypertrophy of Myometrium.
Senile Atresia of Uterine Canal.
Tuberculosis.
Syphilis.
Echinococcus.

ACUTE CERVICITIS

Acute cervicitis is acute inflammation of the cervical mucosa and underlying tissue lying between the external and internal os. It is due to infection with ordinary pus germs or with the gonococcus. In gonorrheal vaginitis, the inflammation frequently extends into the cervix and may remain in check there for some time. If in a case of gonorrheal vaginitis applications are made within a healthy cervix, gonorrheal cervicitis is likely to result.

A common form of cervicitis due to ordinary pus bacteria is that found in lacerations of the cervix with everted mucosa, in which inflammation comes and goes owing to irritation of the turned-out mucosa by the vaginal bacteria. Streptococcic or staphylococcic infection of the cervix may follow labor or abortion, but in the acute stage it is usually overshadowed by the more serious inflammation in the body of the uterus, i.e., the septic metritis.

419

When there is pelvic congestion from any one of its various causes, there may be increased secretion of clear cervical mucus and some reddening about the external os. This is frequently designated cervicitis, but it is apparently a circulatory rather than a bacterial disturbance. This hypersecretion with some erosion comes not infrequently in virginal conditions, when the patient is generally atonic or there is occupational or postural or endocrine pelvic congestion. It is seen also in the newly married, when care must be exercised to avoid mistaking it for beginning gonorrheal infection.

Symptoms and Diagnosis

The principal symptom of acute cervicitis is increased discharge from the cervix, with the irritation resulting therefrom. The cervical secretion is tenacious and stringy and resembles the white of an egg except that it is less fluid and more jellylike. The normal cervical secretion is clear and alkaline in reaction. In gonorrheal cervicitis the free pus admixture causes the mucus to become an opaque yellow plug in the cervix, with the tenacious stringy qualities characteristic of cervical mucus. In inflammation due to other bacteria the pus admixture is usually less in amount. There is usually considerable erosion about the external os, from the irritating discharge. There are also hyperemia of the cervix and bleeding on slight manipulation. The patient has an uneasy sensation of weight and discomfort in the pelvis, though acute cervicitis alone rarely causes pain. If there is much pain, it is probably due to some other trouble, for which search should be made.

Acute cervicitis causes but little trouble in diagnosis. The irritating partially opaque mucous discharge from the external os shows that there is inflammation in the cervix. The absence of pain and of tenderness of the body of the uterus on bimanual examination, and the absence of other symptoms of endometritis indicate that the inflammation is confined to the cervix. Whether or not it is gonorrheal may be determined by looking for evidence of gonorrhea elsewhere (vagina, urethra, vulvovaginal glands) and by examining the discharge for gonococci.

Treatment

The objects of treatment in a case of acute cervicitis are (a) to prevent the inflammation from spreading to the body of the uterus and (b) to remove the irritating discharge and the consequent discomfort. These effects are best secured by prompt administration of sulfathiazole or other sulfonamide, to check the gonococcal process and eliminate it as soon as possible. Details are given under Gonorrhea in Chapter IV. As to local treatment, attainment of the objects mentioned is aided (1) by avoiding any treatment or instrumentation within the cervical canal, limiting all applications to relieving irritation of the vaginal walls, (2) by warm lactic acid douches once or twice daily to remove the accumulating irritating discharge from the vagina, and (3) by limiting activity, such as dancing or long walking or other unusual exertion. Occasional office application of some mild antiseptic to the irritated vaginal walls and cervix will aid in relieving the discomfort.

CHRONIC CERVICITIS

Including Erosion, Eversion, Laceration, Cyst Formation, Leucoplakia, and the Sequelae of Laceration

Chronic cervicitis is chronic inflammation of the tissues of the cervix. It usually starts in the lining mucosa, but has extended deeply into the surrounding tissues by the time it becomes chronic.

Chronic gonorrheal cervicitis and chronic septic cervicitis follow acute inflammation of like character, though in some cases the acute symptoms are so slight as to escape notice. Laceration of the cervix is a fruitful source of chronic cervicitis, opening up the cervical glands and lymph spaces to the infection.
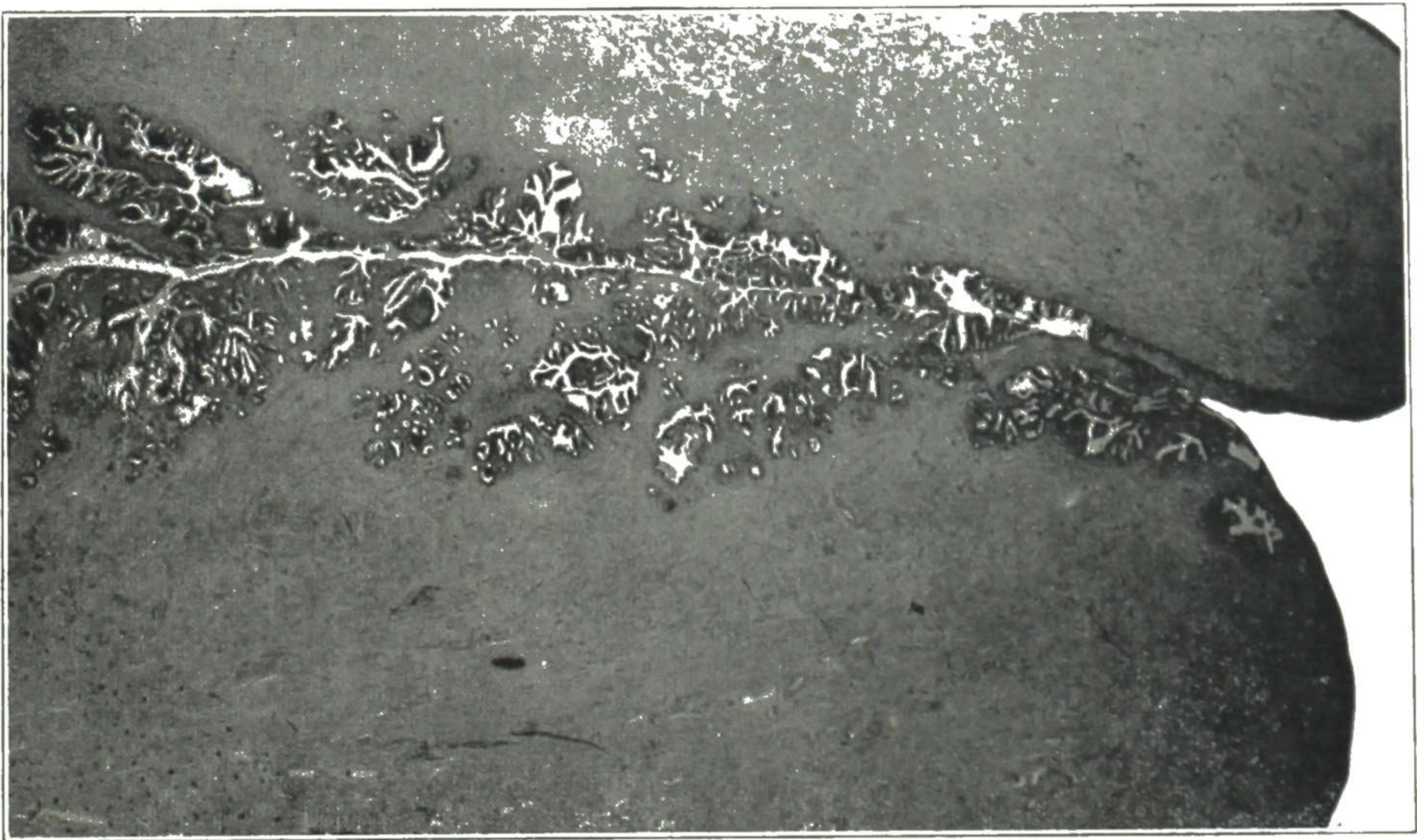

Fig. 609.—Cervicitis, chronic and localized to certain areas. This photomicrograph shows a considerable part of the cervical canal with its branching glands. The external os with its squamous epithelium is well shown. Notice that there are scattered inflammatory areas in the gland walls, both near the cervical canal and in the deeper portions of the glands. Each point of infection is surrounded by an area of round cell infiltration. This is brought out better in the high power (Fig. 610). Gyn. Lab.

Disturbance of the normal vaginal acidity is another possible etiologic factor in the complex condition. Roblee, who has made instructive studies of the pH variations in vaginal and cervical conditions, feels that faulty pH of the vaginal contents is an important factor, probably more important than the old infection, in keeping up and causing extension of cervical erosions and associated conditions, and hence that it must be considered in planning treatment.

Changes in Cervix

The infecting germs penetrate the mucosa and underlying structures, affecting the glands and interglandular tissue, as shown in Figs. 609 and 610. As the inflammation starts in the lining mucosa it is often referred to as "endocervicitis," but it quickly involves the underlying deeper tissues and

consequently the more comprehensive term "cervicitis" is better. There is increased secretion from the cervix and the clear cervical mucus becomes a mucopurulent discharge.

In the clinical picture of chronic cervicitis there are certain features which need individual attention. These features are erosion, eversion, laceration, cyst formation, and leucoplakia.

Erosion.—That phase of chronic cervicitis designated as "erosion" is very interesting in several directions. The term itself is rather confusing in that we ordinarily think of an eroded surface as one which has lost its epithelial

Fig. 610.—Cervicitis, chronic. This is a high power of a small area in the left half of Fig. 609, just below the cervical canal. The lumen of the canal is seen at the upper margin. A localized infected focus is seen in the right side, with some smaller foci in other parts. These two photomicrographs show clearly why applications in the cervical canal are of little avail in curing chronic cervicitis—the foci are outside the canal and inaccessible to such applications. Gyn. Lab.

covering, whereas when a microscopic section of an "erosion" of the cervix is examined it is found covered with columnar epithelium, which has replaced the pavement epithelium normal to that location.

Ries puts the matter thus, "The name is explained by the development of our knowledge of erosion. In the primitive period of gynecology, when the speculum furnished the closest means of study of the cervix, the early observers believed the red areas to be raw. The name 'erosion' expressed their concept of an area deprived of the normal surface layer. When Ruge, Veit, and later R. Meyer, studied the microscopic appearance of these areas it became evident that there was no denudation, but a change from the normal stratified

epithelium to the columnar type. The name 'erosion' was therefore corrected into pseudo-erosion, but the usage of decades has been to call the condition *erosion*."

Erosion is started by irritation, usually from inflammation, and in its development there is a regular sequence of events which have been admirably described by Robert Meyer, Schottlander, Frankl, and others. To harmonize the name with the microscopic findings it has been assumed that, before the columnar epithelium grew out, the area must have been denuded of the squamous epithelium, leaving a real eroded area (the primary "erosion"), and that what we see in sections constitutes the various stages of healing. Meyer in his classical description adopts this view and designates the ordinary findings as "healing erosion," and gives an interesting description of the different stages of healing. We have followed this plan as a working basis, and steps in the progress of healing are clearly illustrated by photomicrographs from our departmental laboratory.

The difficulty about the unqualified acceptance of the idea of a primary denuded area of any considerable extent is that no one sees such a denuded area. Again, casting off of the pavement epithelium over the area in question and then covering of the denuded area by columnar epithelium is not the only way in which replacement of pavement epithelium by columnar could take place. It seems just as reasonable for the replacement of the pavement epithelium by the columnar to be simply a gradual pushing off of disintegrating pavement epithelium by the outgrowing columnar epithelium, without there being a real denuded area at any time.

The single-layered columnar epithelium covering the area permits the underlying vascular tissue to show through, giving a red appearance to the area. Fig. 611 is a diagrammatic representation of the microscopic details of the erosion area, the outlines of which as viewed through the speculum are shown in Fig. 612. At the middle of the upper margin of the microscopic diagram is the outer limit of the erosion. To the right is the many-layered squamous epithelium, which gives the pinkish-white color to the normal cervix, as shown in Fig. 613, *A*. To the left is the beginning of the erosion, which on inspection is red, as shown in Figs. 613, *B* and 613, *C*.

This condition represents the first step in repair; that is, in the area where the many-layered protective squamous epithelium is damaged and dying, the quick-growing columnar epithelium has taken its place as a temporary covering, to be replaced later by the slower-growing squamous epithelium which forms the permanent protection. This process of repair from start to complete healing goes through a regular sequence of events, which have been admirably described by Robert Meyer, Schottlander, Frankl, and others. For convenience in description this healing process is divided into three stages. It is important to know the general plan and details of these stages, for it is this knowledge which enables understanding of the complex and confusing microscopic pictures, some of which may be easily mistaken for carcinoma.

First Stage of Repair or Healing. The columnar epithelium quickly grows out over the denuded or eroded area. This covering of the denuded area by columnar epithelium is so rapid that a bare area is seldom seen. In fact, the two processes probably go on simultaneously, the columnar epithelium advancing little by little as the squamous epithelial covering disintegrates. There is dilatation of the capillaries and round cell infiltration of the underlying muscle and connective tissue.

The new layer of columnar epithelium covering the damaged surface proliferates so rapidly that it is thrown into minute folds, giving somewhat of a granulating appearance to the surface of the ordinary erosion (Fig. 613, *B*). In some cases these folds become high (Fig. 614), producing a velvety appearance like projecting granulations. This condition is designated "papillary erosion" (Fig. 613, *C*). In addition to covering the surface, the columnar epithelium tends to grow down into the underlying tissues and form "glands." If the openings of these temporary glands become obstructed small retention cysts are formed. Also, the projecting papillae may become adherent, thus blocking escape of the

secretion of the cells. A third factor in cyst formation, and probably the principal one in making the larger cysts, is the blocking of the regular glands of the cervix. When the cysts are numerous they form the "cystic erosion," as shown in Fig. 613, *D*. The cyst contents may be clear or may contain pus admixture, giving a yellow tinge as in the illustration. These little retention cysts of cervical glands were first described by Martin Naboth (about 1700) and are commonly called "nabothian cysts."
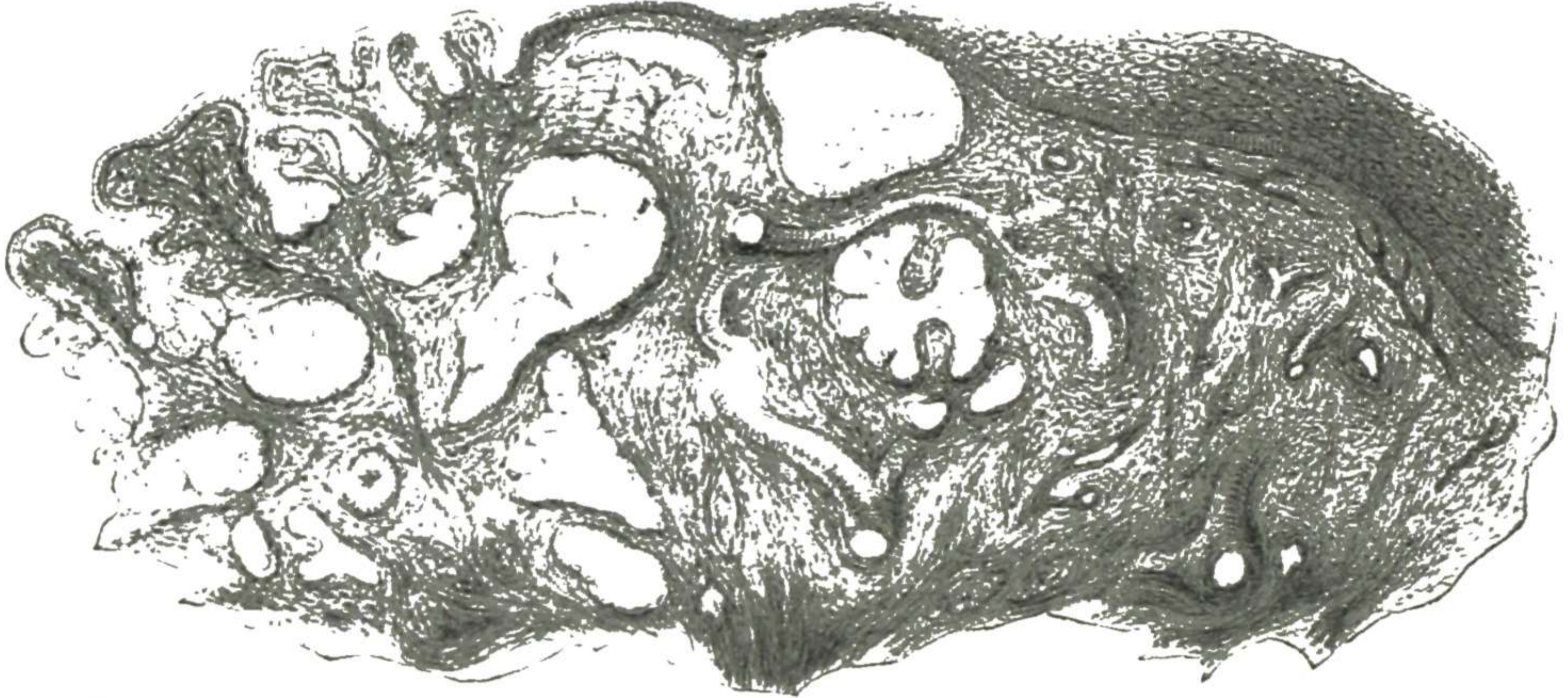

Fig. 611.—This historic diagrammatic section still serves well the purpose of calling attention to the essentials of an erosion of the cervix. At the right is the normal squamous epithelium covering the vaginal portion of the cervix. At the left is the area of erosion, showing the papillary projections covered with a single layer columnar epithelium. The cavities below the surface show the tendency to cyst formation. (A. Martin—*Atlas of Gynecology*.)
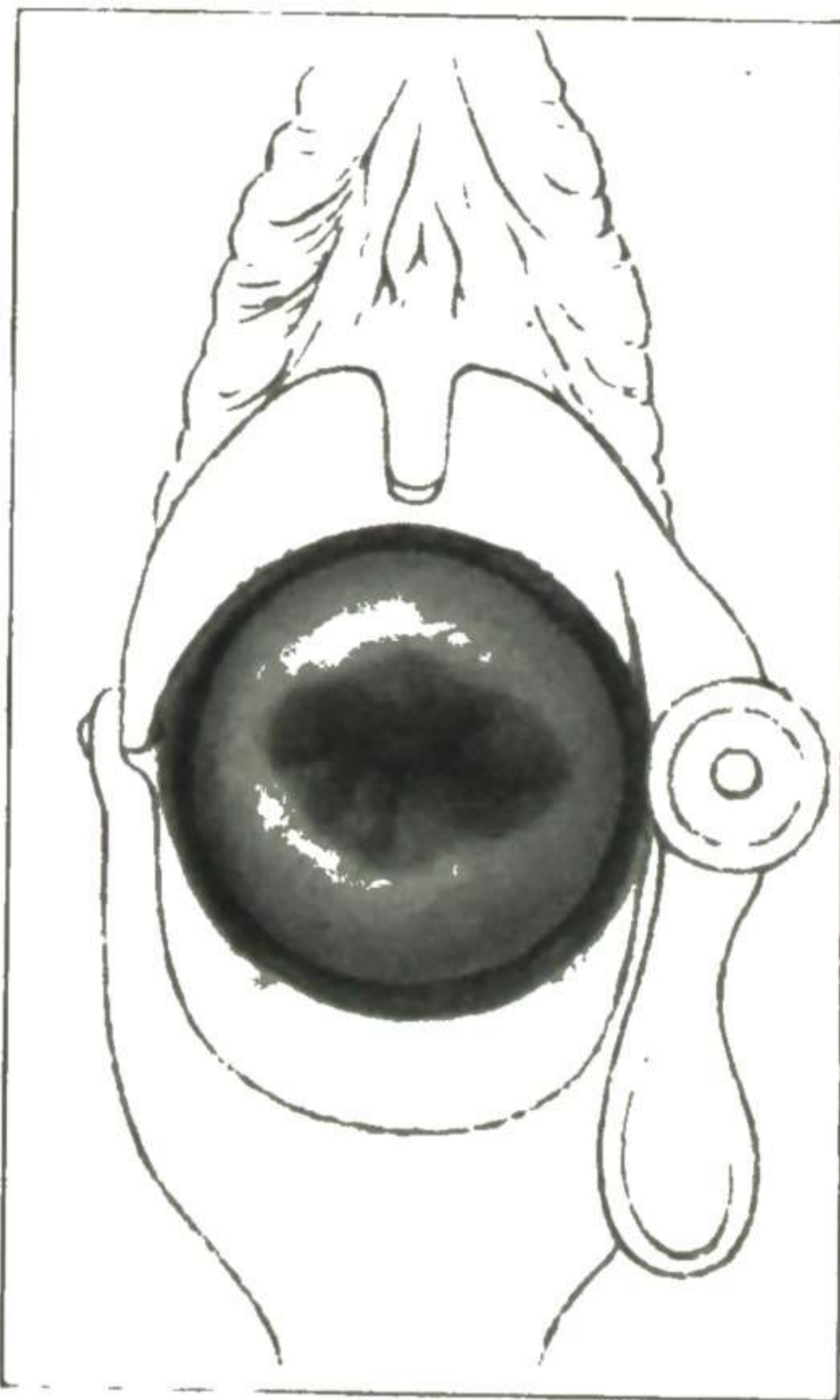

Fig. 612.—The usual appearance of an erosion on a multiparous cervix. The cervix is somewhat lacerated, and around the slightly everted cervical mucosa is the wide, irregular, red area of erosion.

Second Stage (Figs. 615 to 621). In the second stage of healing the squamous epithelium grows in from the edges, and from any remaining islands of squamous epithelium which were not cast off during the earliest stage. This epithelium grows under the columnar epithelium, displacing it. At the lumen of the glands it may dip in and displace the lining epithelium or it may seal off the lumen of the gland. If the latter occurs, the blocked glands may dilate beneath the squamous epithelium and form small cysts (nabothian
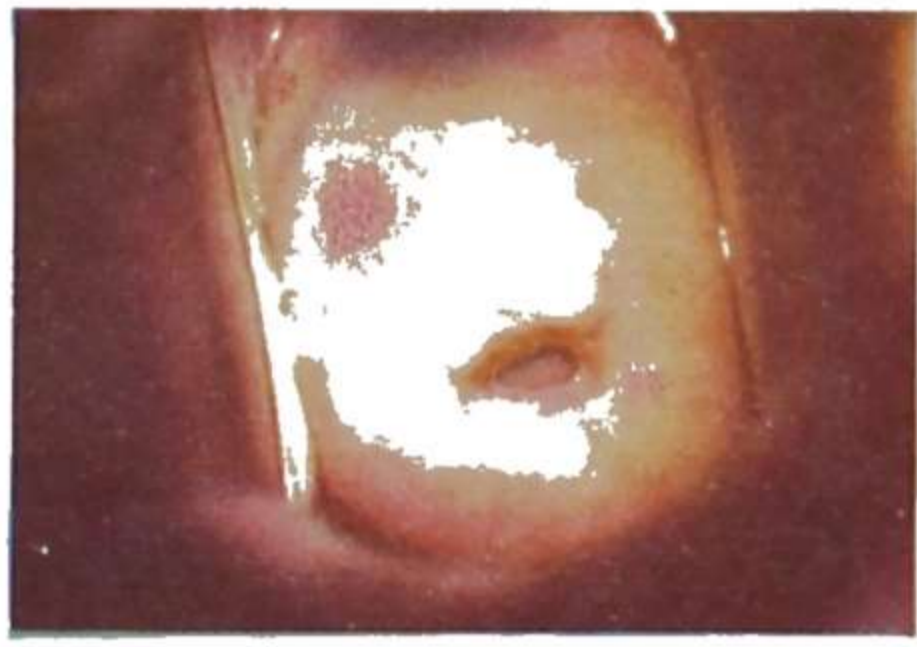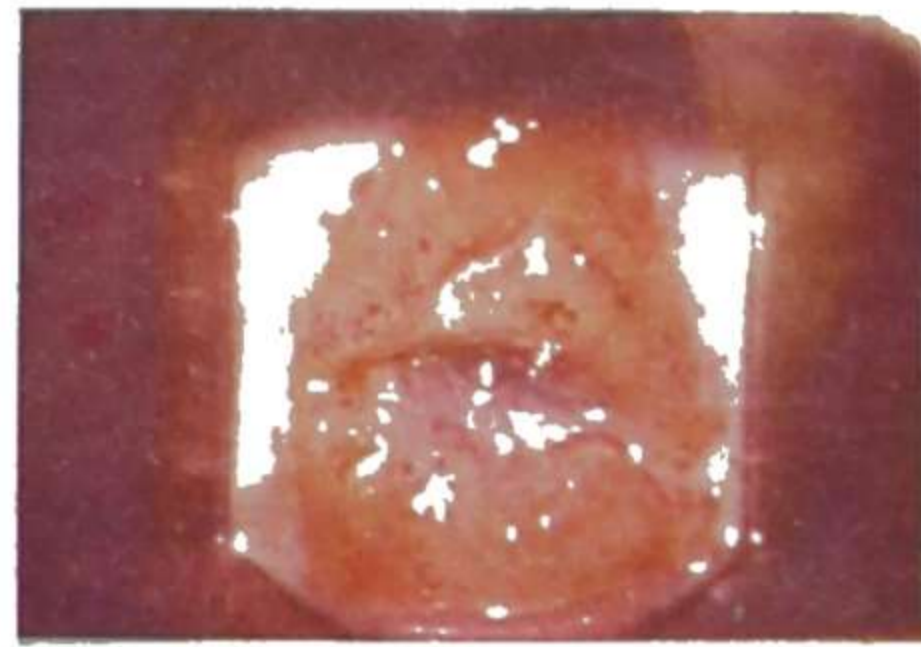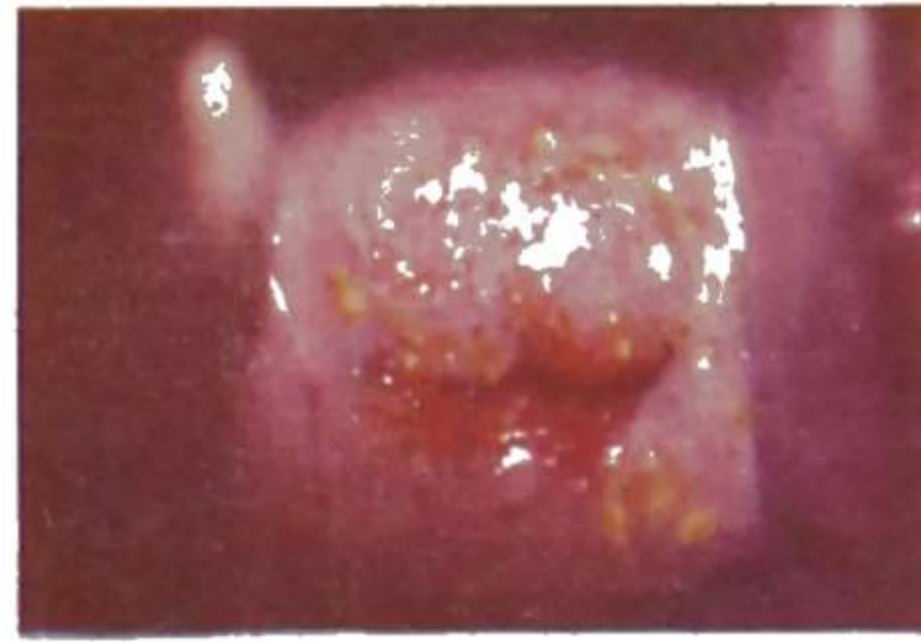
Fig. 613.—Colored photographs showing the characteristics of cervical erosions. *A*, appearance of the normal cervix; *B*, an extensive erosion; *C*, an erosion with definite papillary features; *D*, a cystic erosion, with pus in some of the cysts. (Baumrucker—By courtesy of Surgery, Gynecology and Obstetrics; Copyright, 1938, The Surgical Publishing Company of Chicago.)
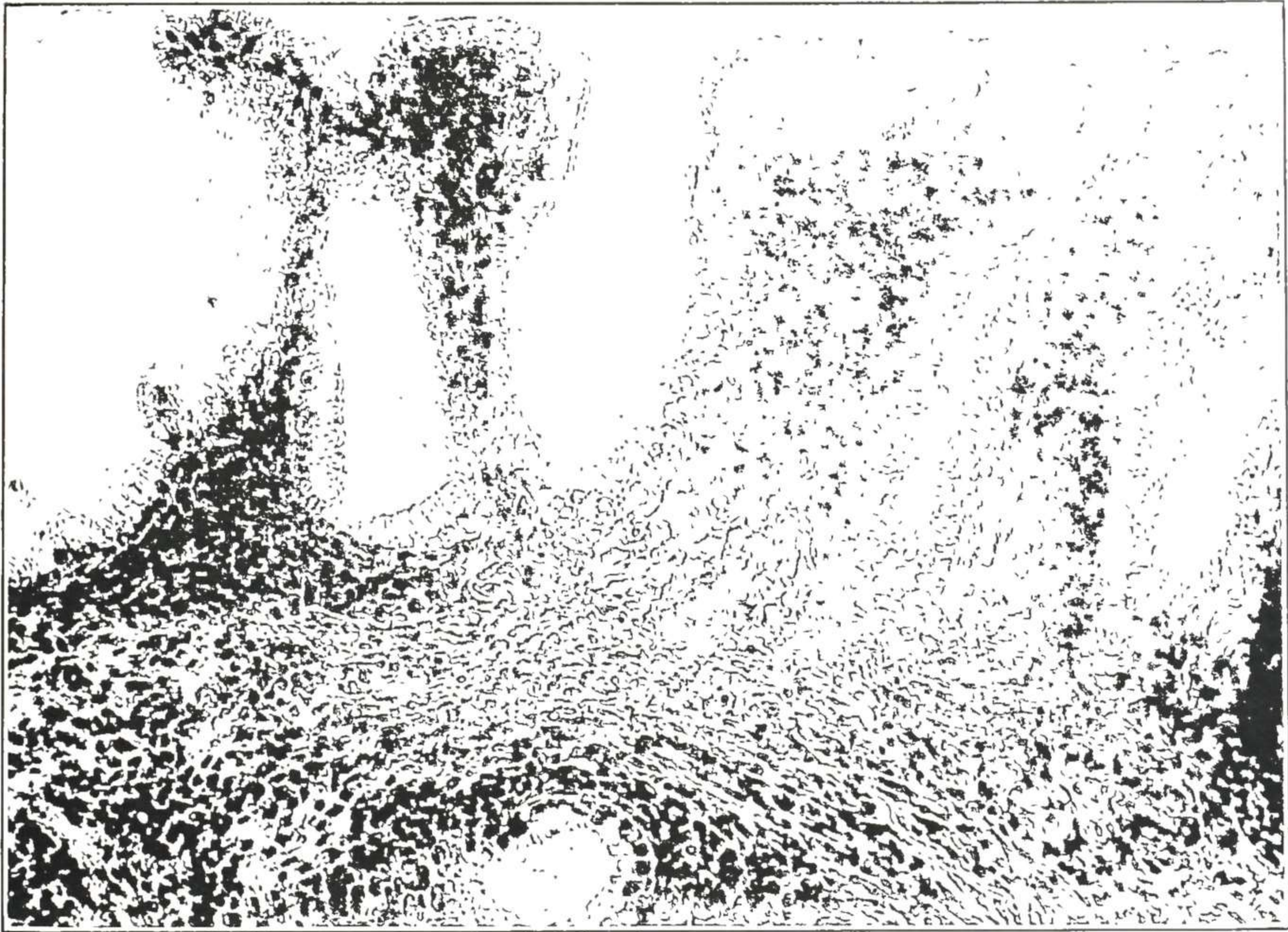
Fig. 614.—Papillary erosion. An early stage showing all surfaces covered by columnar epithelium. At the bottom of the illustration is seen a small gland. Gyn. Lab.
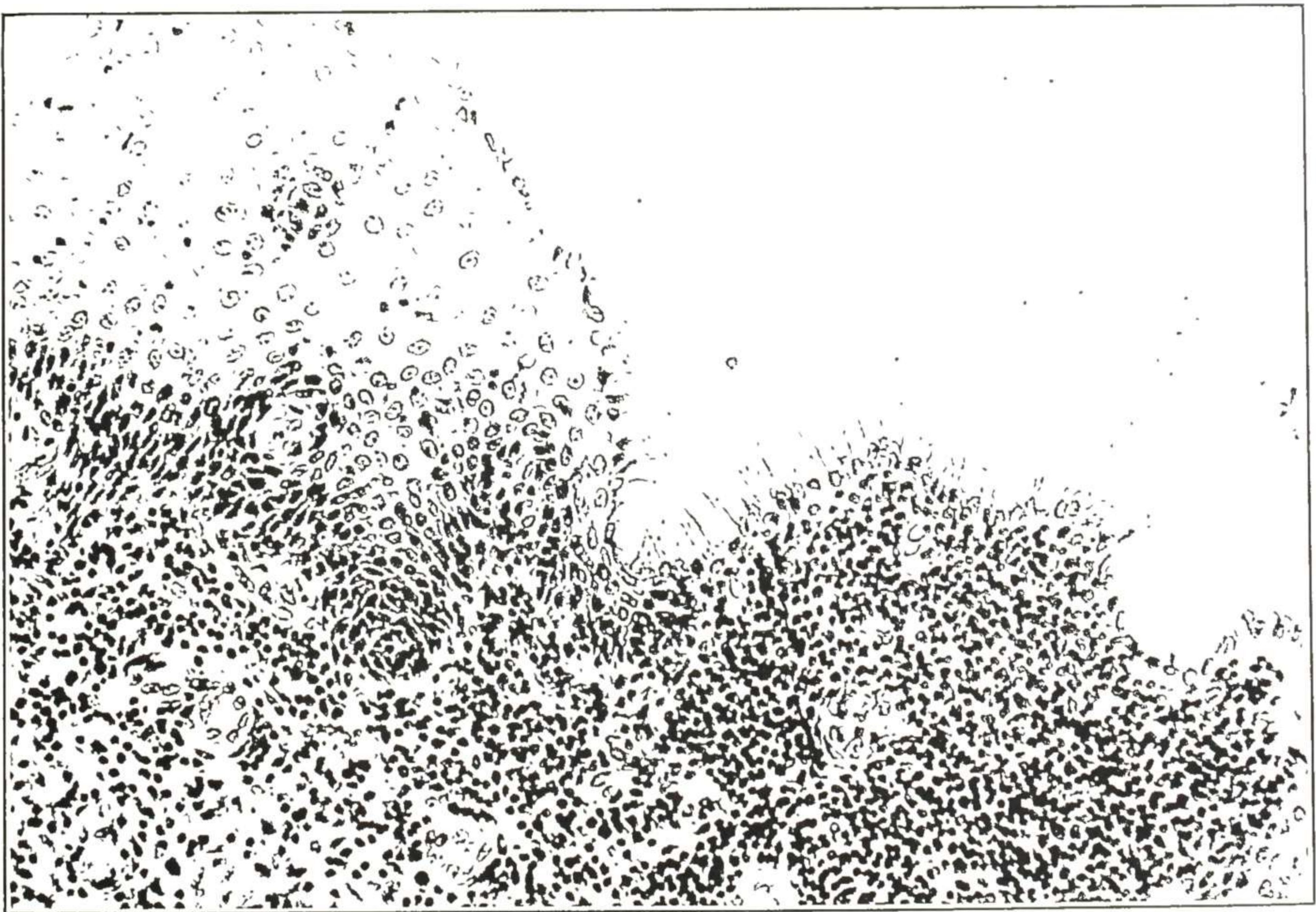

Fig. 615.—Healing erosion. Very early second stage. In the right half of the photomicrograph is seen the area of erosion covered over by the single layered columnar epithelium from the cervical canal. Beneath this epithelium the round cell infiltration is still present. The squamous epithelium at the left is beginning to grow beneath the columnar epithelium. As this "creeping under" process proceeds, the columnar epithelium is raised from the surface and gradually disintegrates. Here the columnar epithelium may be seen in all stages of necrosis, from mere remnants near the top of the picture at left of center to the perfect columnar epithelium covering the site of the erosion. Gyn. Lab.

cysts), which contain clear mucus or opaque pus. These little cysts or abscesses may rupture through the surface, causing a repetition of the desquamation of the squamous epithelium.

Third Stage (Fig. 622). In the third or final stage of healing, the buried glands are taken over completely by the squamous epithelium, which continues to grow under the columnar epithelium, pushing off and disintegrating it. Spontaneous healing of the entire erosion is rare.

Coordinating Points. The healing process is not in the same stage in all parts of the cervix. Usually the various stages of healing can be seen by examining different areas of the same erosion. The picture may be extremely varied, with confusing intermingling of the two types of epithelium. A detailed study of the illustrative slides will make clear the salient features of erosion. The protecting squamous epithelium having been disintegrated by irritation, and the area quickly covered by outgrowth of the columnar epithelium, the regenerating squamous epithelium begins to regain the area by creeping under the tem-
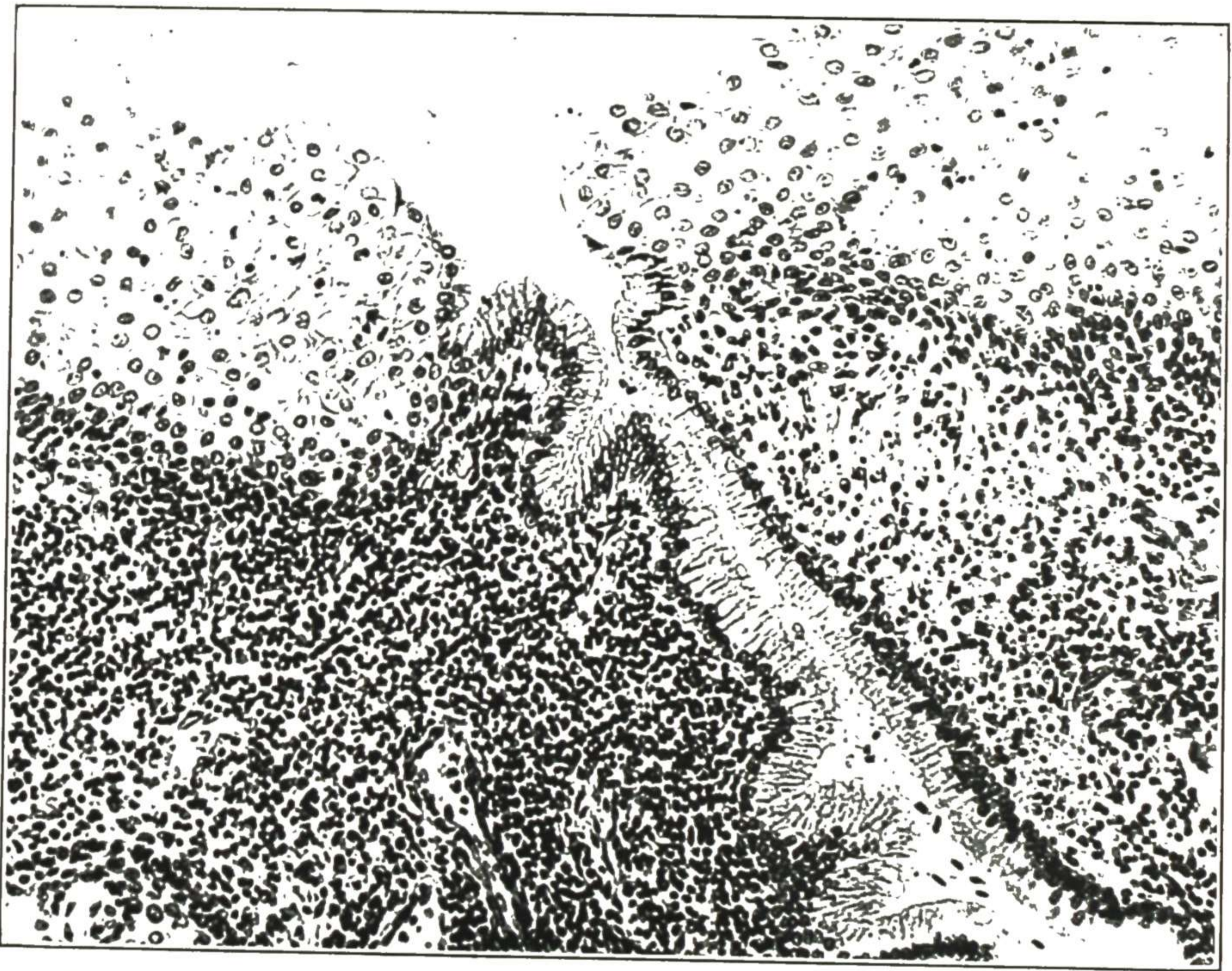

Fig. 616.—Healing erosion. The squamous epithelium has grown down from both sides and is seen here surrounding the duct of a gland. This gland is one of the many formed by the columnar epithelium which recently covered this area. From this point in the process of healing the squamous epithelium may do one of two things. It may grow across the opening leaving the gland beneath with no opening to the surface or it may encircle the gland, destroying the glandular epithelium and plugging the remaining space with squamous epithelium. If the former occurs, it is called the second stage of healing; if the latter occurs, it is designated as the third stage of healing. Notice the marked round cell infiltration in the underlying muscle. Gyn. Lab.

porary columnar epithelial covering. The beginning of this process is well shown in Fig. 615. The various stages and ramifications of the interesting phenomenon of replacement of columnar epithelium by squamous epithelium in an erosion can be seen in this series of photomicrographs.

This creeping of squamous epithelium under the columnar epithelium, displacing the latter and filling in aberrant gland cavities with solid masses of pavement epithelium, gives rise to microscopic pictures which require great care to differentiate from the aberrant cell masses of carcinoma. The differential diagnosis is taken up under the Microscopic Diagnosis of Cervix Cancer.

There it will be noted also that this faculty of regenerating squamous epithelium to creep under and displace columnar epithelium is not always limited to an area of erosion but may extend into the cervical canal and involve normally placed glands, giving squamous-cell masses deep in the cervix. This "epidermization" of areas ordinarily occupied by columnar epithelium, follows, of course, the gland outline; i.e., one of the distinguishing characteristics is that it follows "the trellis work of the glands" instead of being the haphazard invasion of malignancy.
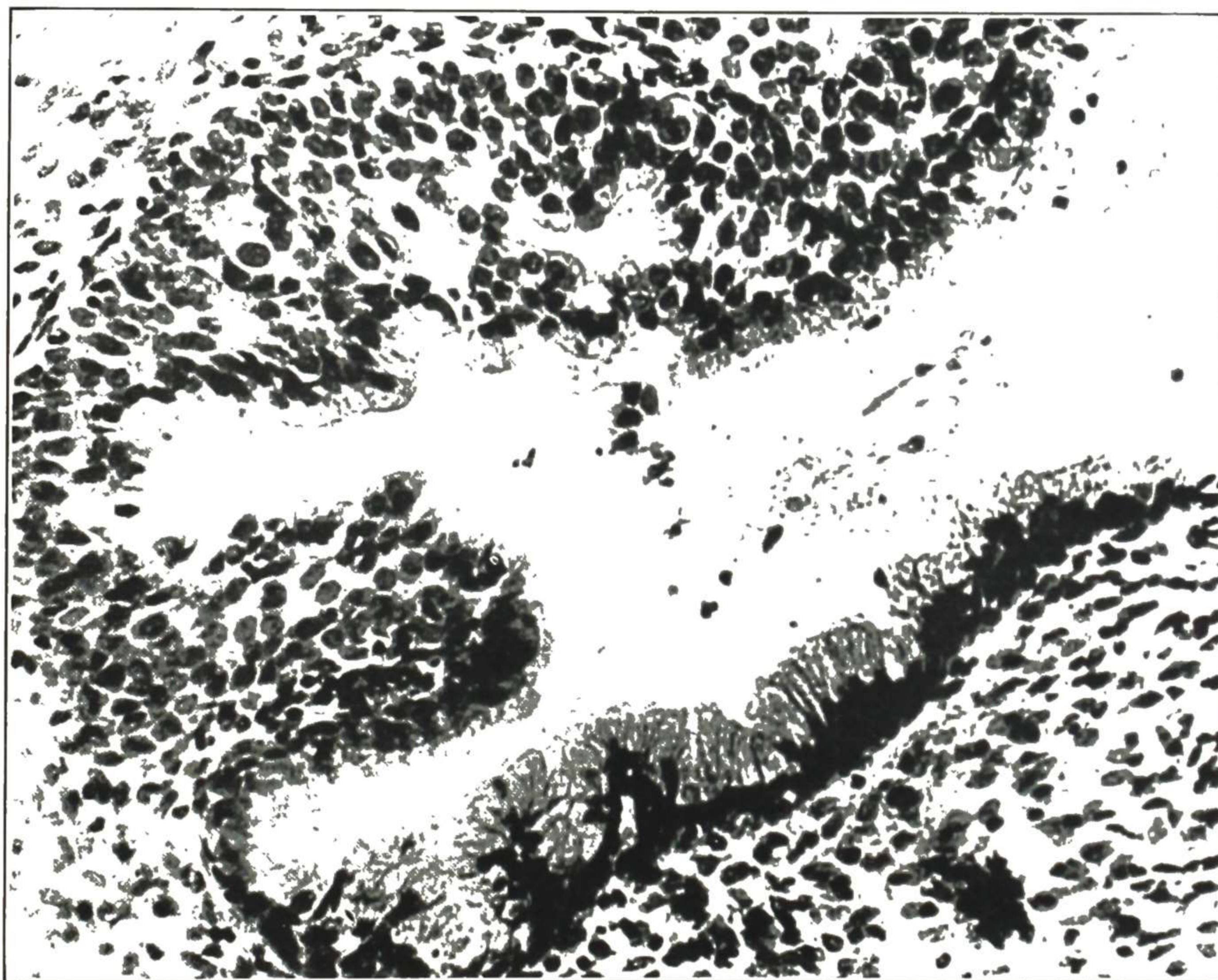

Fig. 617.—Healing erosion. The squamous epithelium is beginning to encircle the gland. The advance is along the upper wall, where it has lifted the columnar epithelium over a large area. Remnants of the latter may be seen along the upper surface of the cavity. The edge of the invading squamous epithelium is seen beneath the papilla at the left lower portion of the picture. The remaining intact columnar epithelium is seen on the lower wall of the gland. Gyn. Lab.

The question of metaplasia of columnar cells (or columnar-cell antecedents) to squamous cells enters some of these cases of extensive epidermization in the cervix. This origin is more evident, of course, in epidermization of the endometrium, mentioned in the Microscopic Diagnosis of Carcinoma of the Corpus. Novak in accounting for this squamous epithelium where only columnar epithelium should be states that we must consider three possibilities.

1. Direct extension of squamous epithelium from its normal situation (Meyer). This "creeping" tendency of squamous epithelium is clearly shown in our slides (Figs. 615 to 621) and is probably responsible for most of the epidermization seen in the cervix. It is possible for it to extend also to the endometrium, particularly if inflammation has prepared the way by damaging the intervening columnar epithelium.

2. Transformation or "metaplasia" of adult columnar epithelium into epithelium of the squamous type (Ruge).

Fig. 618.—Healing erosion. In this section a superficial gland has been completely under-mined by squamous epithelium and pushed out into the surface epithelium. It will soon be cast off with the superficial layer of the epithelium. Gyn. Lab.
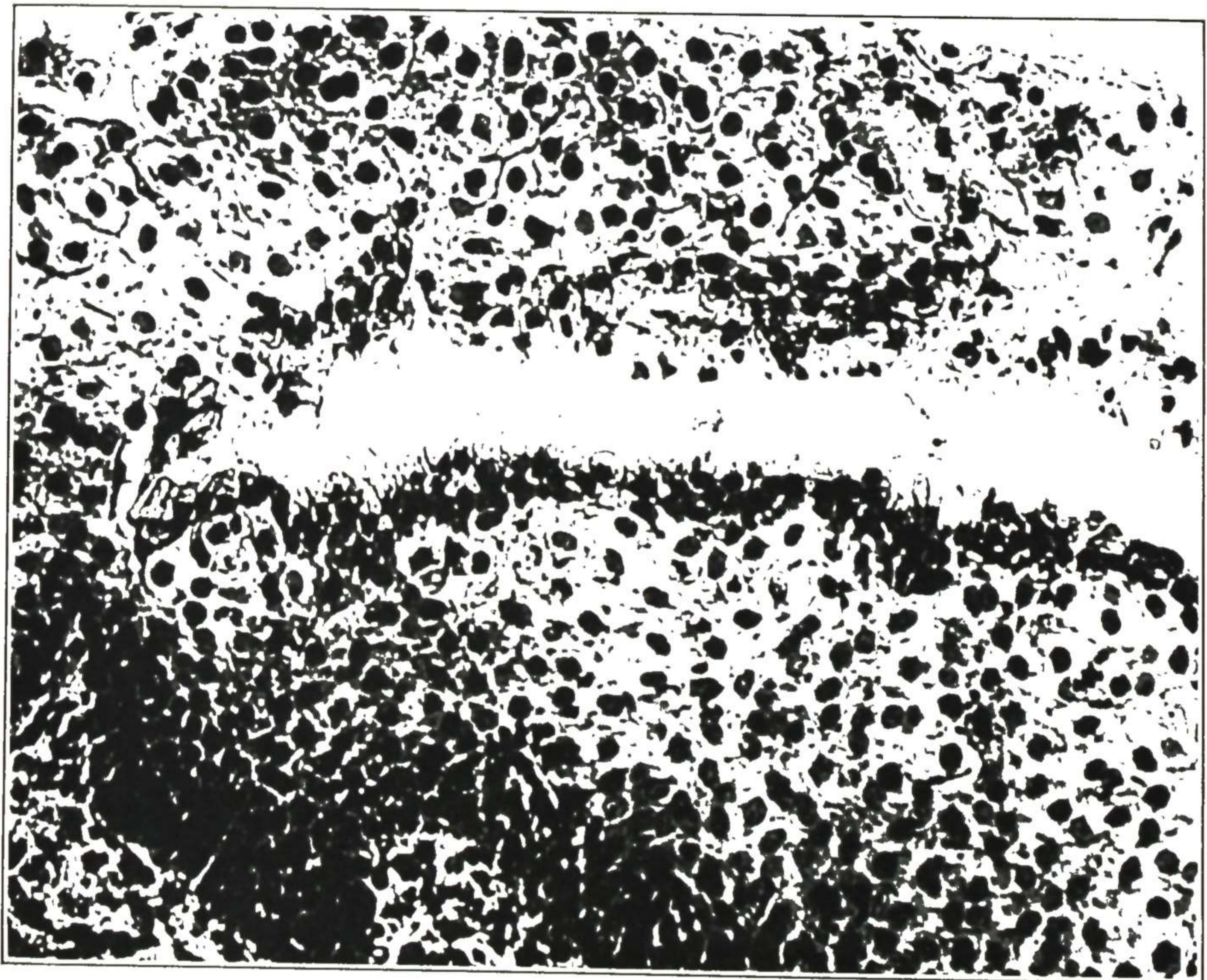

Fig. 619.—Healing erosion. High power of the gland shown in Fig. 618. Gyn. Lab.

3. Growth of squamous epithelium from embryonal rests of undeveloped cells (Meyer). These embryonal cells presumably retain the power to develop into squamous epithelium under proper stimulus. The extensive epidermization occasionally found in the endometrium is apparently due to embryonal rests or metaplasia.

A congenital type of erosion is described by Fischel, who states that it is found in 30 per cent of newborn infants. Frankl states that in the six-month

Fig. 620.—This shows various stages in the process of replacement of columnar epithelium by squamous epithelium as it encircles the gland and eventually plugs it. In the left half of the section there are three cavities, each showing a stage of the process. The upper cavity still has columnar epithelium on its lower border. In the lower cavity only remnants of the columnar epithelium remain. In the middle cavity the columnar epithelium has been eliminated and the cavity is completely filled with squamous epithelium. The cavity showing the intermediate stage is shown further magnified in Fig. 621. Gyn. Lab.
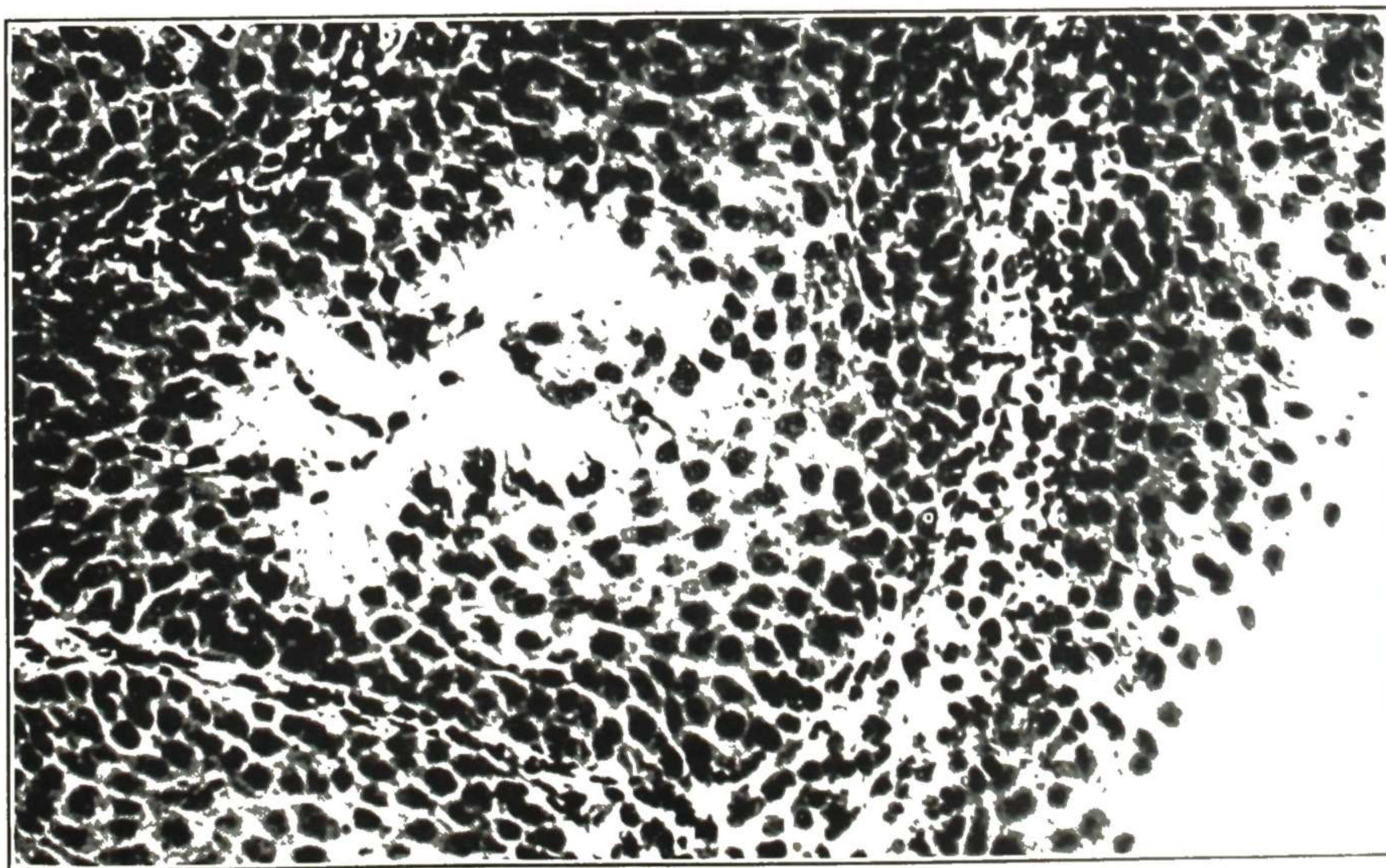

Fig. 621.—Healing erosion. High power of the cavity from the left lower corner of Fig. 620. This stage shows the intermediate stage in the process of replacing the columnar cell lining of the cavity by a solid mass of squamous epithelium. A few remnants of columnar epithelium may be seen in the débris at the center of the vanishing cavity. Gyn. Lab.

fetus the squamous epithelium covering the cervix extends into the cervical canal, but at the end of fetal life the junction of the two types of epithelium is usually in the neighborhood of the external os. If the columnar epithelium extends over the surface of the portio one speaks of it as a congenital pseudo-erosion. After birth there is, as a rule, a desquamation of the columnar epithelium, and the area is covered over by squamous epithelium from the border or from islands of squamous epithelium which have remained beneath the columnar epithelium.

There is an endocrine factor in erosions in the newborn and in children and in certain cases in adult life. Wollner was able to alter the histologic picture of atrophic cervices by administration of estrin and progestin. Estrin stimulated the proliferation of columnar cells, giving a picture of glandular hyperplasia with marked hyperemia and edema, such as is commonly seen in
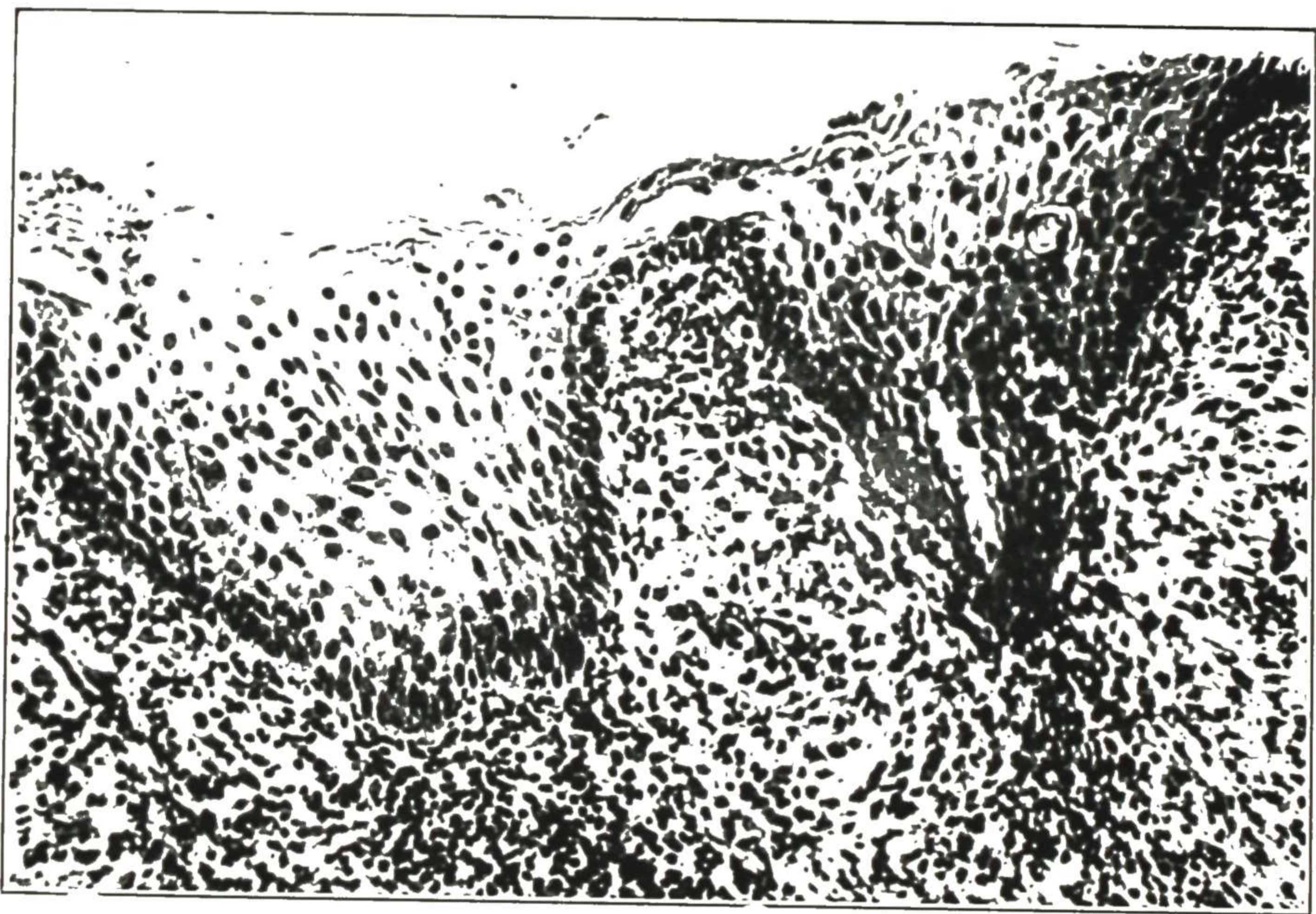

Fig. 622.—Healing erosion, third stage. In this area, all of the columnar epithelium has been eliminated, and the depressions filled with squamous cells. There is still much round cell infiltration beneath the surface, and the epithelial covering is very thin in places. Gyn. Lab.

endocervicitis cases. Progestin, on the other hand, stimulated the growth of the squamous epithelium. With a combination of both hormones, the estrin seemed to accentuate the action of the progestin on the squamous epithelium, while the progestin inhibited the effect of the estrin on the columnar epithelium. These facts help to explain the occurrence of cervical erosion in the new born, where there is unopposed action of the maternal estrin. Fischel found cervical erosion in 30 per cent of stillborn children, and Meyer in 33 per cent. Some of the erosions found in young girls where there is no evidence of infection can be explained on this endocrine basis, and treatment with progesterone should be tried before resorting to any severe local measures.

Eversion.—In chronic cervicitis, the inflammatory infiltration causes marked thickening of the mucosa and underlying tissues. As these tissues become more

and more thickened, they push out in the direction of least resistance, which is at the external os. This rolling-out (eversion) from inflammatory infiltration is most marked in the cervix which has been lacerated.

Eversion may occur also in a cervix where there has been no laceration, the rolling-out of the thickened mucosa with the consequent enlargement of the external os giving a very deceptive appearance of laceration (Fig. 630). This swelling and eversion from chronic inflammation may take place in the unmarried, and may become so marked as to give rise to an erroneous diagnosis of previous pregnancy.

Laceration.—Troublesome symptoms from cervix laceration and conditions requiring treatment are due largely to complicating inflammation. The changes brought about by inflammation in a lacerated cervix are progressive, and this progressive character with its underlying causes must be understood in order to recognize the various stages of the process as encountered in clinical work. To elucidate this matter let us follow through what may happen in a case of moderately deep laceration of the cervix, as represented by Fig. 623, *A*.

If there is no complicating inflammation of the torn surfaces, they may fall together and unite, leaving only a small notch as in Fig. 623, *B*. If they fail to unite, they may heal over by granulation and scarring, leaving two thin lips without special irritation or other disturbance (Fig. 623, *C*). In either case the condition causes no trouble and requires no treatment.

If inflammation supervenes, there follow an interesting series of progressive changes, leading to the various conditions seen in the later examination of such patients. As the inflammation penetrates into the cervix, the resulting infiltration causes marked swelling. This enlargement of the deeper tissues causes expansion in the direction of least resistance, which is inward toward the canal. The firm muscular wall of the cervix prevents expansion outward and prevents much lengthening of its outer portion. Consequently, as the increasing tissue accumulates in the inner portion of the damaged cervix, it tends to push apart the lips and roll out at the opening, causing eversion as indicated in Fig. 624, *A*.

This exposure of the endocervix to the vaginal bacteria and irritation increases the infiltration and eversion. The result is a progressive widening of the cervix and rolling-out of its inner portion, as shown in Fig. 624, *B*.

This process may keep on until the cervix becomes shaped like a ball, as shown in Fig. 624, *C*. This ball-shaped appearance is quite deceptive, as there is no notch to indicate the former deep laceration, and it may cause confusion in diagnosis unless the process of its development is understood. The clinical appearance of moderate eversion is shown in Fig. 625, and marked eversion to the ball-shaped stage in Fig. 626. Other cervices with laceration and chronic cervicitis are shown in Figs. 627 to 629.

A congenital split resembling a lateral laceration of the cervix has been observed in the newborn infant in a few instances. This congenital notch is of little importance, except that when seen in the adult it may lead to an erroneous diagnosis of previous pregnancy. A distinct laceration of the cervix is one of the strongest proofs of previous pregnancy, and the fact that a congenital notch somewhat resembling a laceration may occur is of medicolegal importance. Also, it must be kept in mind as above mentioned that chronic cervicitis may produce a condition of eversion resembling laceration (Fig. 630).

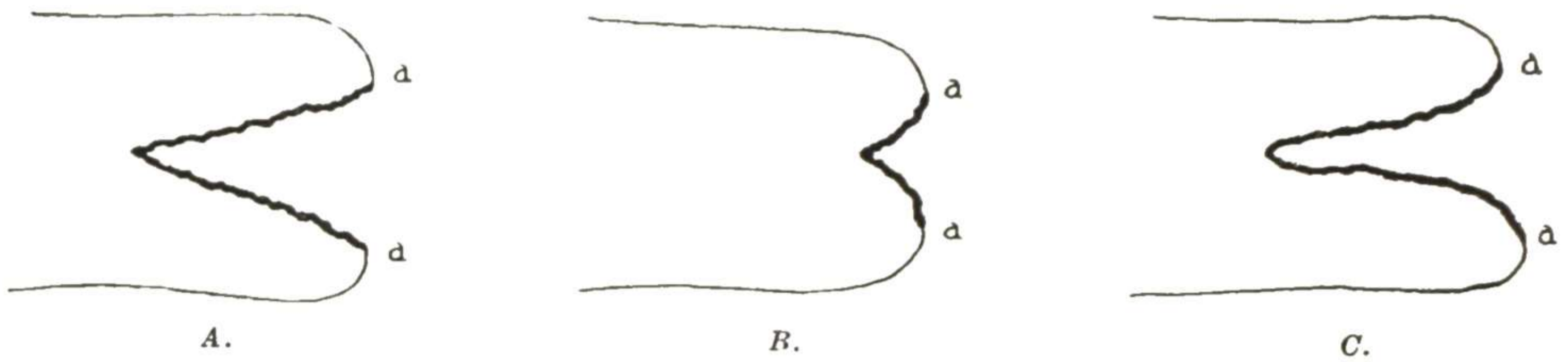A.   B.   C.

Fig. 623.—Illustrating different conditions in laceration of the cervix. *A*, Fresh laceration with the unchanged lips separated. *B*, Practically healed laceration of cervix, only a small notch remaining. *C*, Deep notch with two lips remaining, but the lips are not thickened. Such a cervix rarely causes trouble or requires repair.

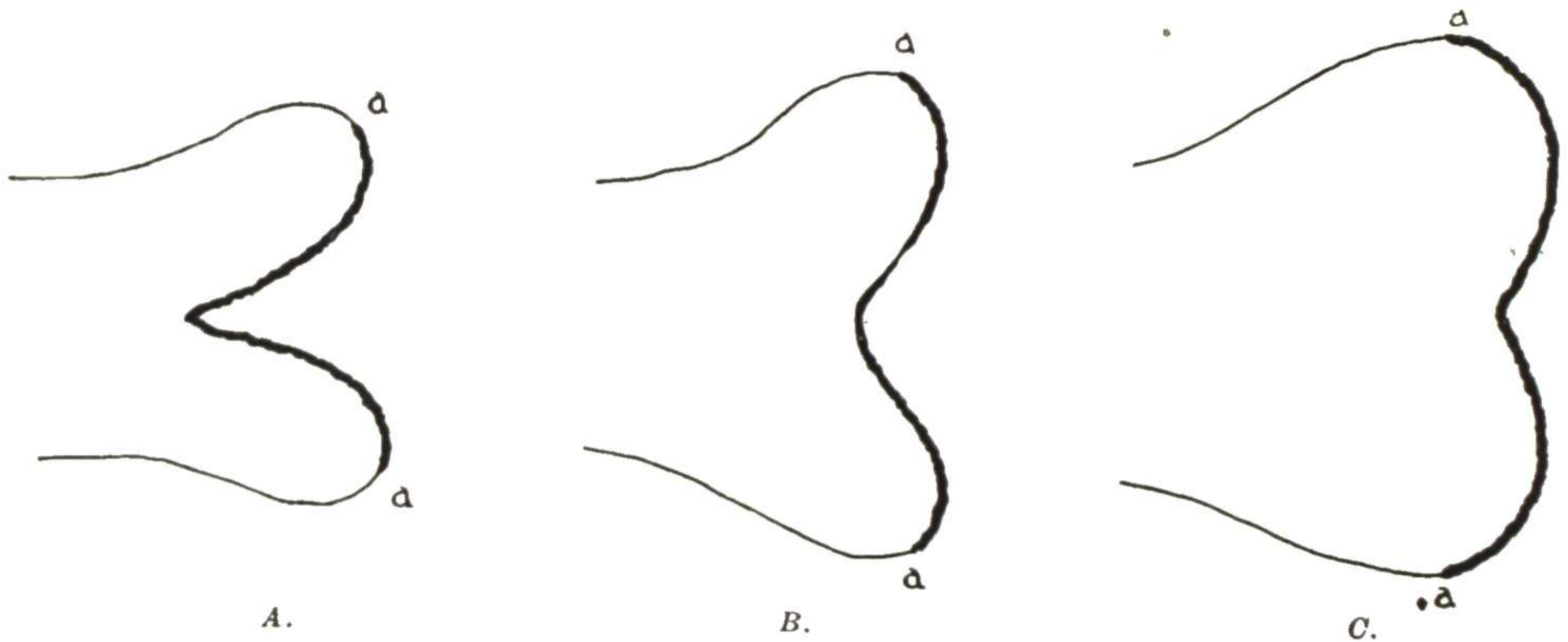A.   B.   C.

Fig. 624.—Different conditions in laceration of the cervix. *A*, Deep notch with thickened lips and beginning eversion. *B*, More thickening of lips and marked eversion. *C*, Marked infiltration and thickening of lips with complete eversion, forming the "ball-shaped" cervix shown in Fig. 626.
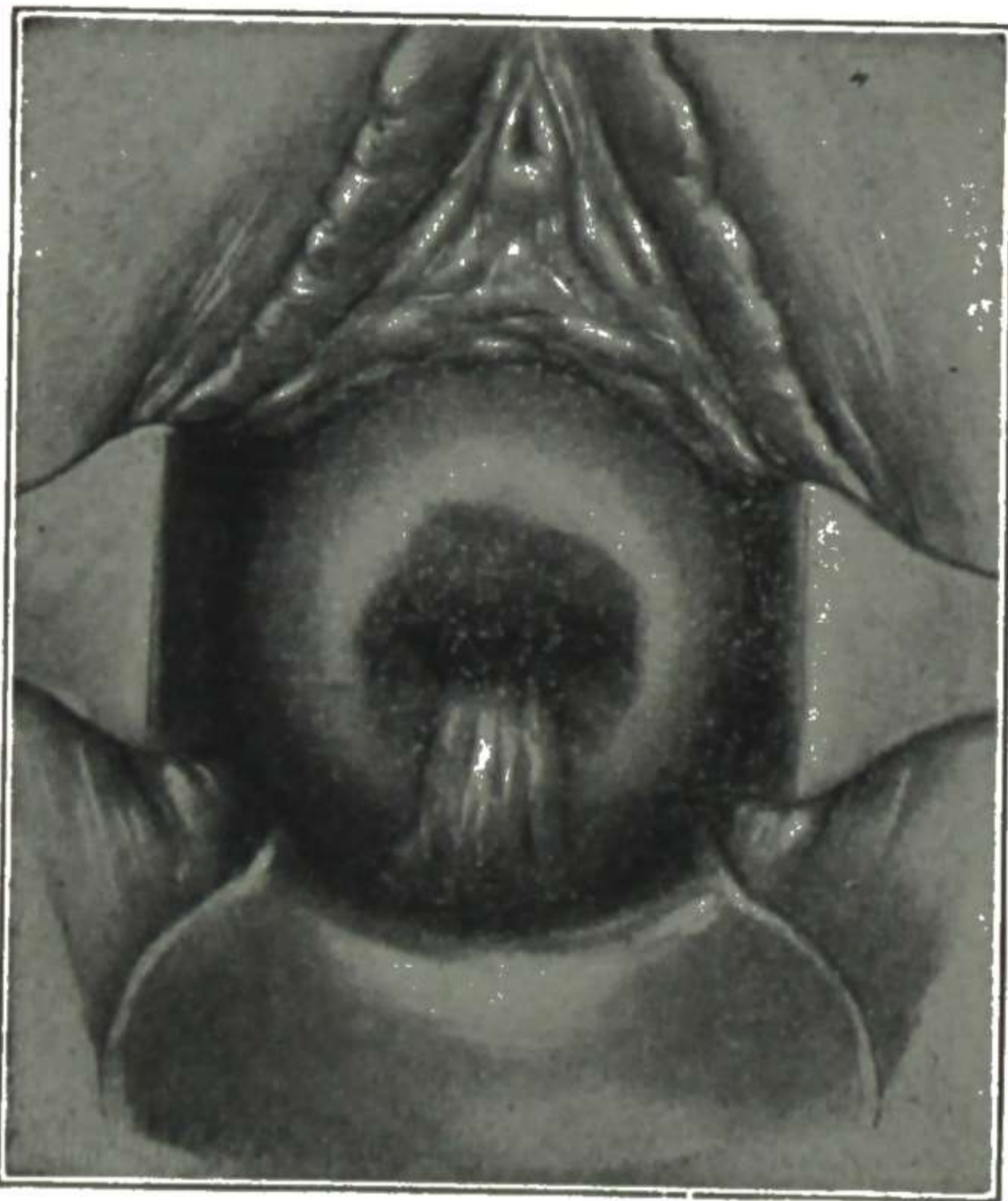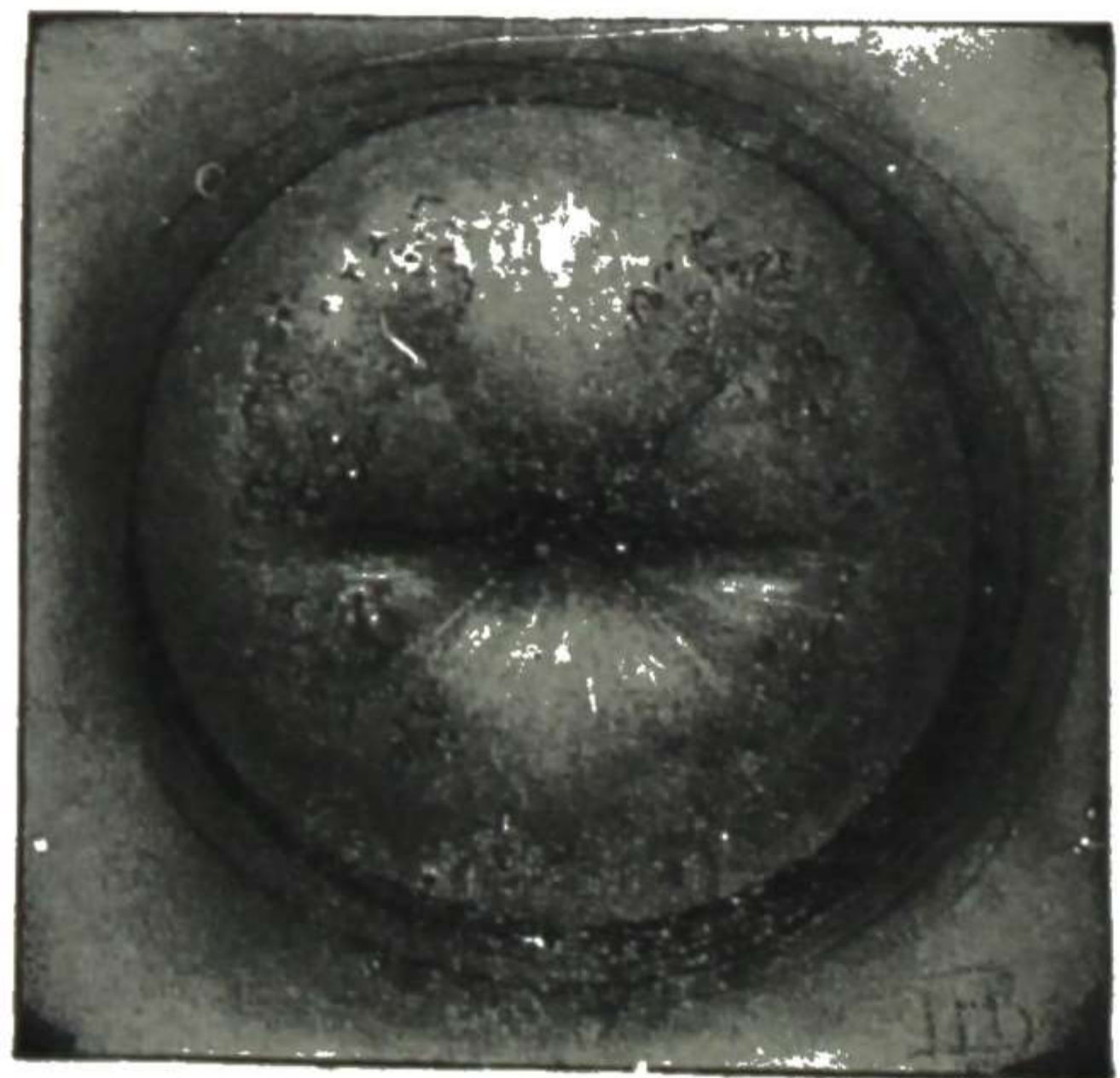

Fig. 625.

Fig. 626.

Fig. 625.—Moderate eversion and erosion in a cervix from chronic cervicitis. There is present also the usual stringy discharge.

Fig. 626.—A lacerated cervix in which there is so much eversion that the cervix appears as a round ball. (Kelly—*Operative Gynecology.*)

Cyst Formation.—The formation of small retention cysts in the cervix is due to obstruction of the ducts of normally situated glands by inflammatory infiltration and to the formation of glandlike cavities in areas of erosion as already explained. If there has been a laceration of the cervix, the resulting scar tissue may obstruct ducts and thus aid in cyst formation.
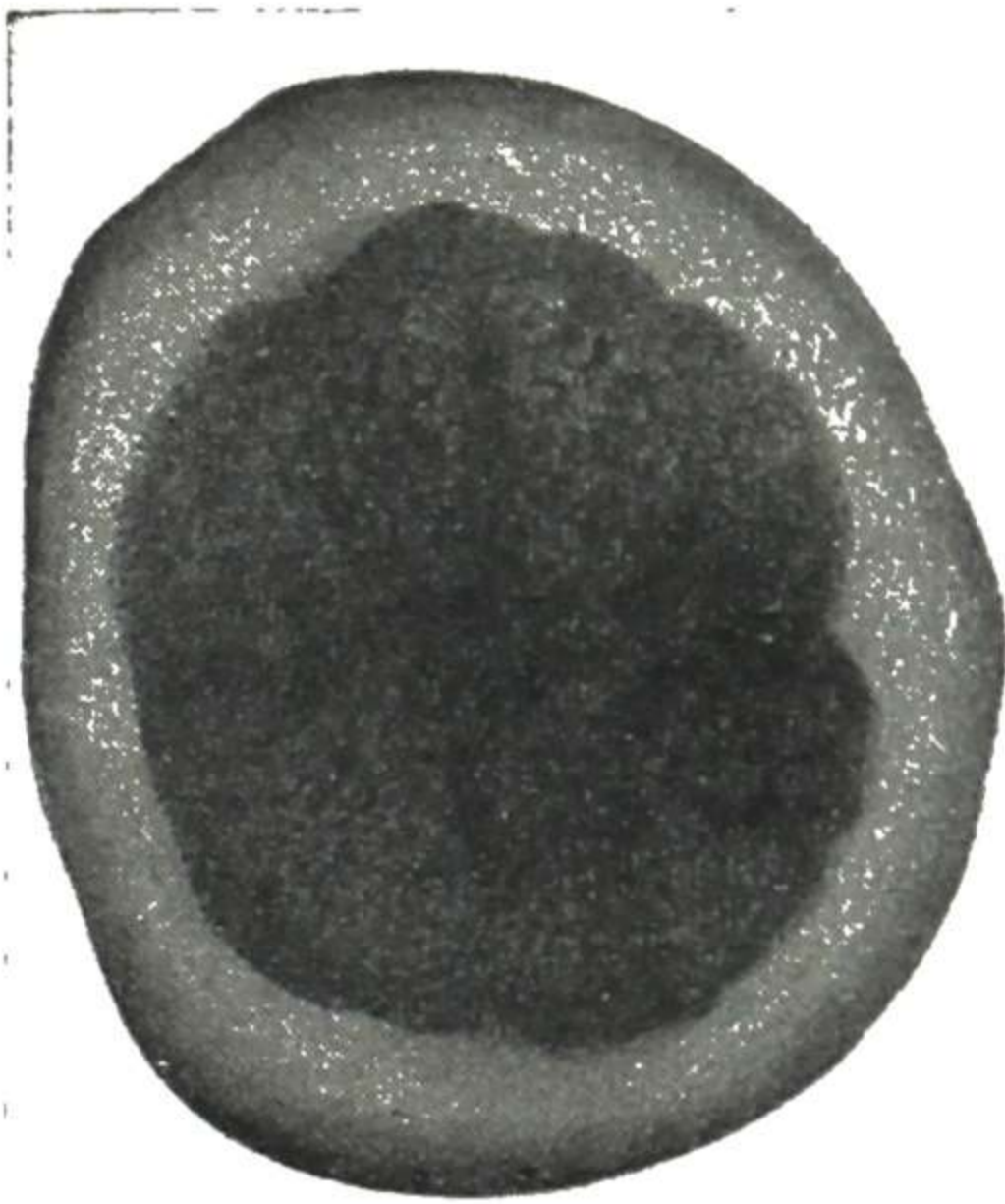

Fig. 627.

Fig. 628.

Figs. 627 and 628.—Bilateral lacerations of cervix. Fig. 627 shows marked bilateral laceration, with distinct lips rolled out. Fig. 628 shows an unusually deep bilateral laceration extending to the vaginal vault. (Mann—*American System of Gynecology*.)
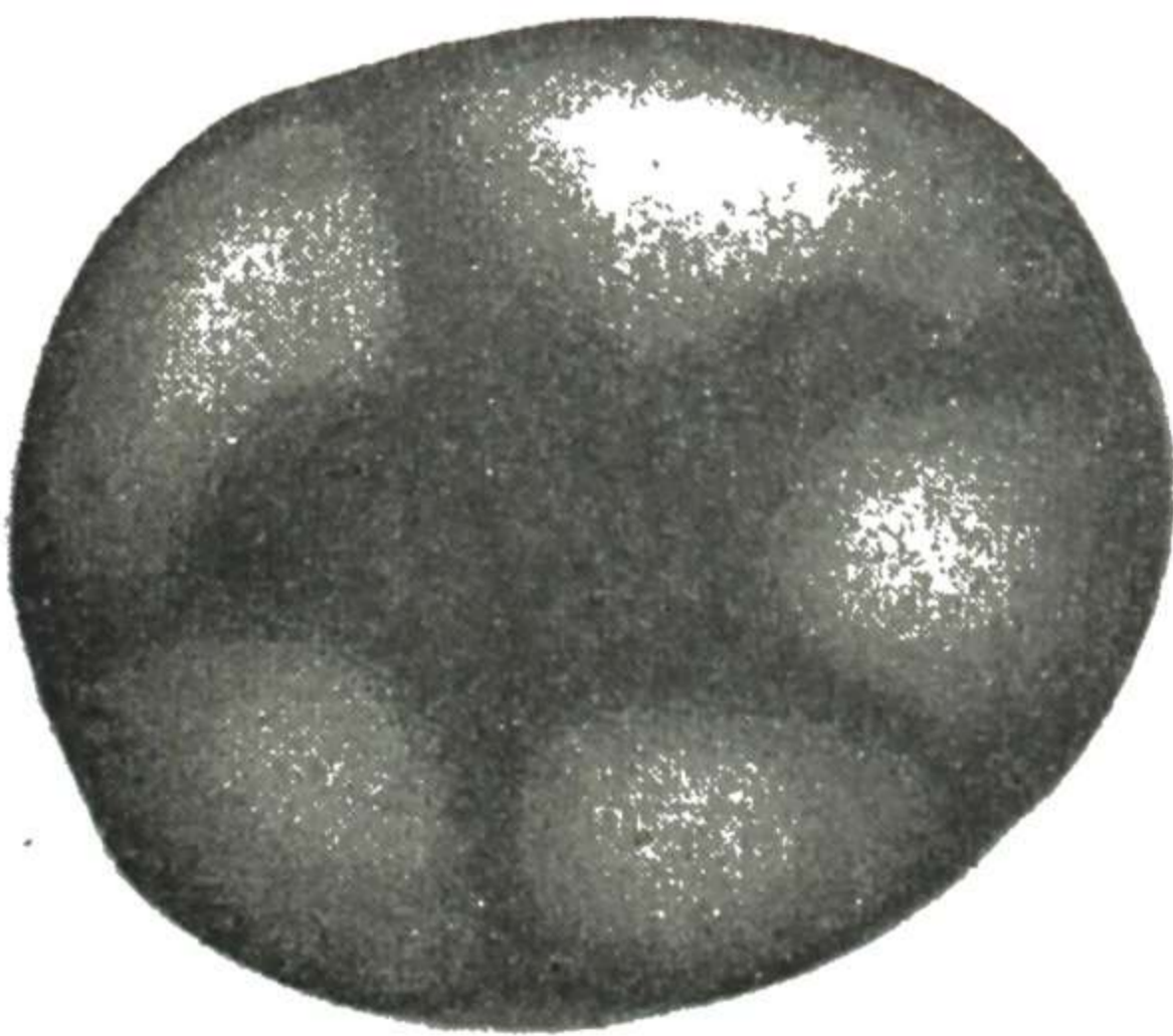
Fig. 629.
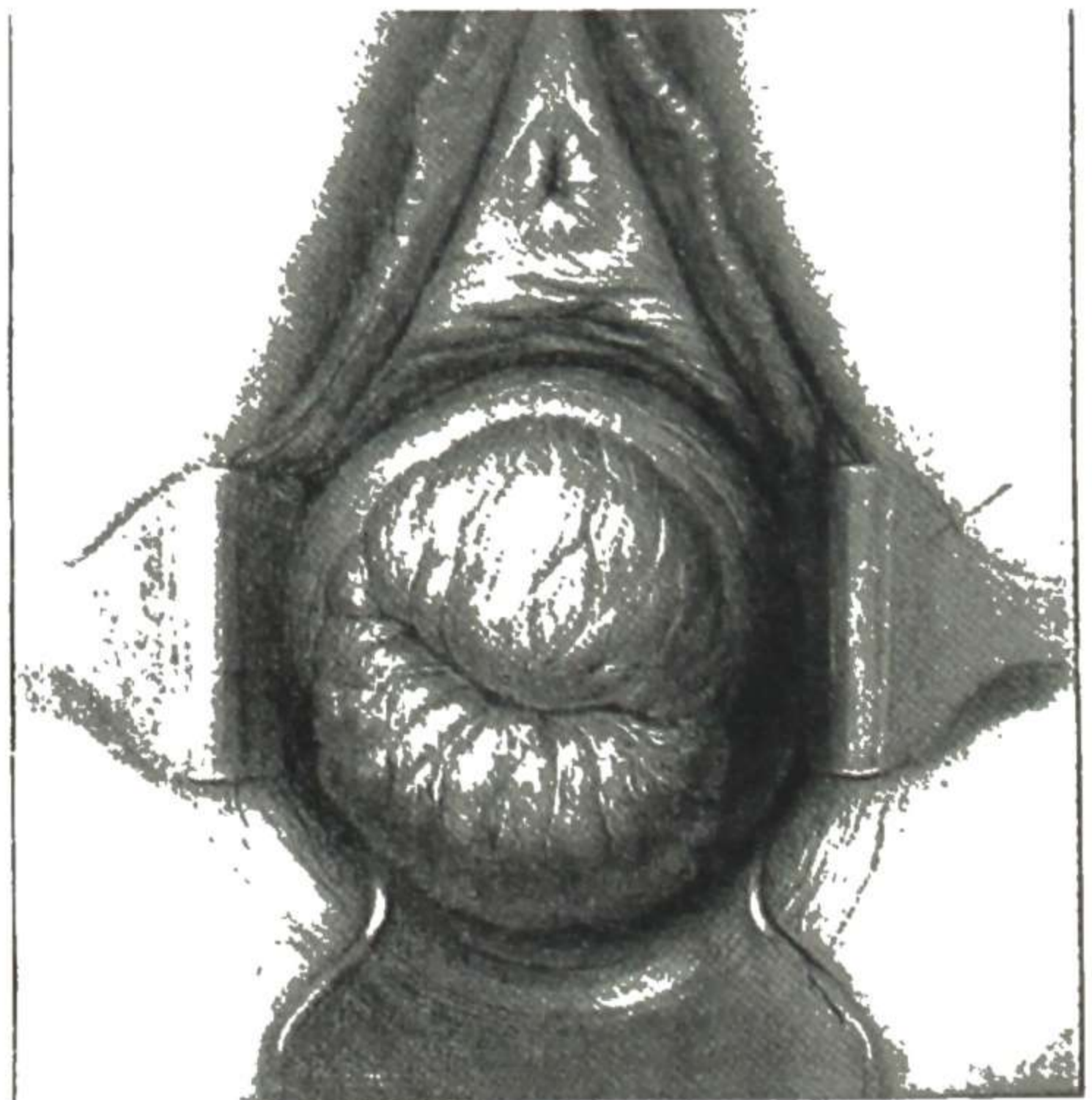
Fig. 630.

Fig. 629.—Deep stellate laceration of the cervix, with resulting thickening and eversion. (Mann—*American System of Gynecology*.)

Fig. 630.—Marked eversion from chronic cervicitis. There is no laceration of the cervix, the patient being a nullipara. (Cullen—*Cancer of the Uterus*, W. B. Saunders Company.)

This eversion of the cervical mucosa by inflammation only, without previous laceration, is likely to lead to a mistaken diagnosis of laceration of the cervix. It is also of medicolegal importance, as the appearance of laceration may lead to the erroneous conclusion that the patient has at some time given birth to a child.

These retention cysts are felt as small hard nodules, like shot of various sizes, in the cervix, and may give rise to an erroneous diagnosis of cancer. The cervix may be honeycombed with these small cysts, producing a condition designated as "cystic degeneration" of the cervix (Figs. 631, 632). The mucus in these cysts is usually clear and presents the characteristic tenacious, stringy consistency. In some cases a cyst may contain pus and appear as a yellow spot (Fig. 613, D).
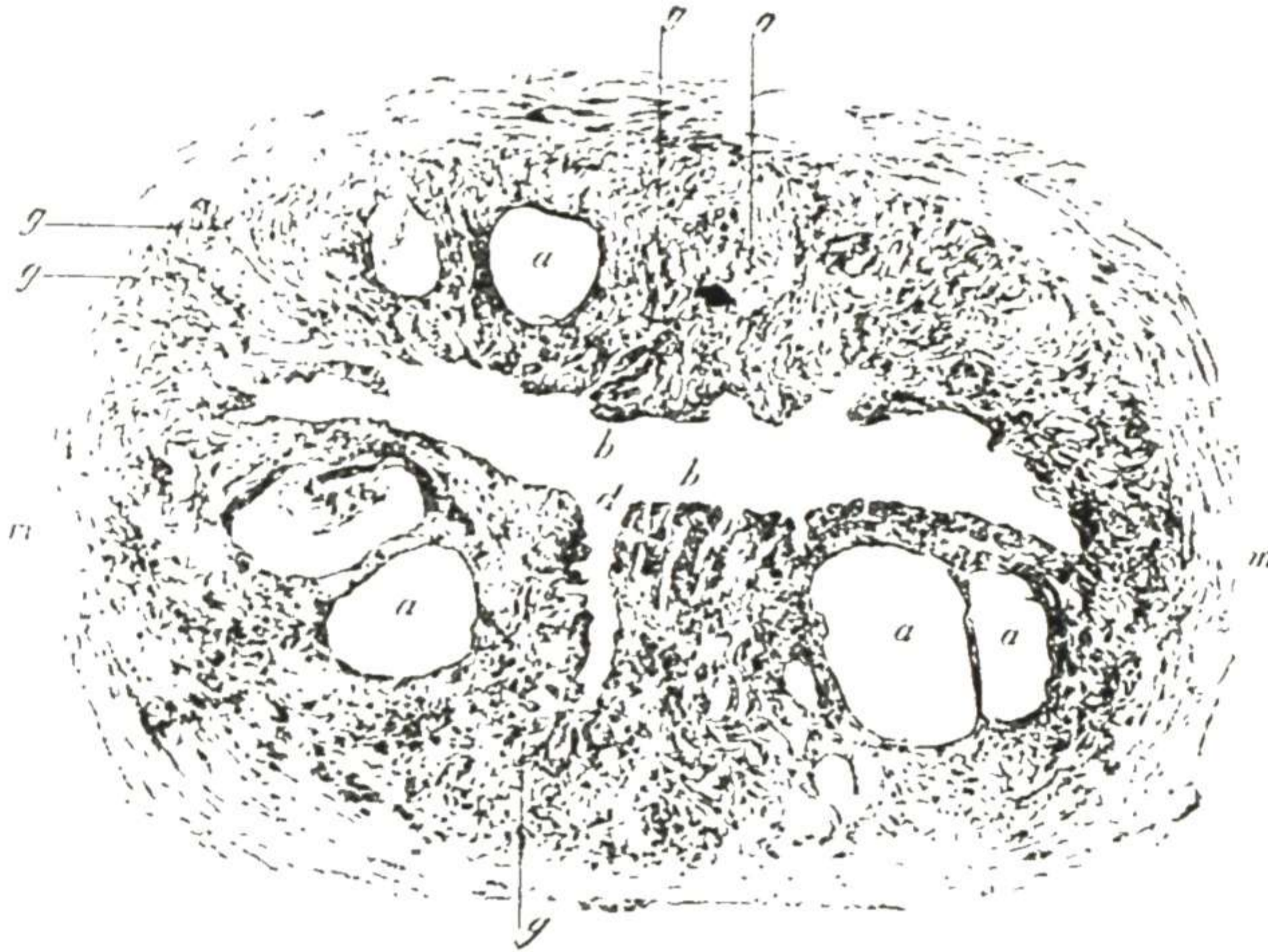
Fig. 631.—Cross-section of a cervix which is the seat of "cystic degeneration." a, dilated gland-cavities, forming small cysts; b, the cervical canal. (Pryor, after Cornil—*Pelvic Inflammation.*)

Fig. 632.—Section of cystic cervix. Notice how the dilated glands extend out under the squamous epithelial layer. Gyn. Lab.

Leucoplakia.—Leucoplakia is the term applied to certain small white areas occasionally seen on the cervix. They are smooth and there may be several, differing in size and shape (Fig. 633).

Although leucoplakia of the cervix was clearly described as early as 1896, very little was done to emphasize its importance until Hinselmann reported a

study of a series of cases by the aid of a colposcope. Since that time the importance of this condition is gradually being realized.

As seen through the speculum leucoplakia appears as a small, smooth, white area on the surface of the cervix. It may be single or multiple. It may be wiped off but returns within two or three days. Occasionally there is a halo of fine vessels around the area. After the area is removed, it loses its whitish appearance and is indistinguishable from the surrounding cervical tissue. Hence
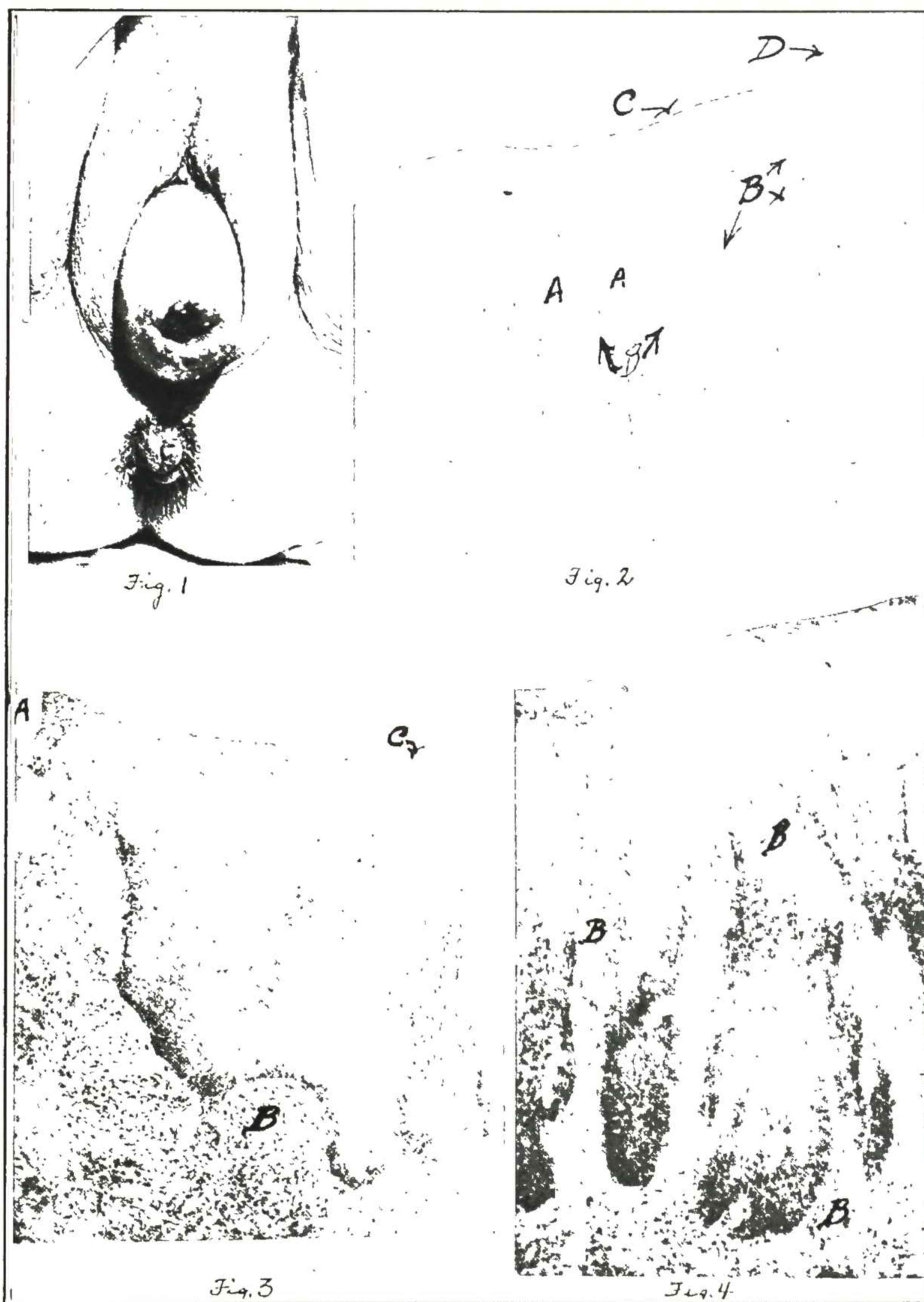
Fig. 633.—Leucoplakia of the cervix. *1,* Prolapsed cervix and uterus, showing dark area of erosion and whitish collar of leucoplakia in the cervix. *2,* Leucoplakic area, showing diffuse round cell infiltration (*B*) at the margin and beneath irregular rete malpighii pegs (*A*). Latter are bizarre and atypical. Cornification present (*C*). Sudden transition to more normal epithelium at (*D*). *3,* A break in the epithelium due to ulceration (*A*); round cell infiltration beneath and between rete pegs (*B*). Stratified squamous epithelium greatly thickened, cornified epithelium covering the surface (*C*). *4,* Irregular and bizarre rete pegs which are atypical, having precancerous appearance. Round cell infiltration between and within rete pegs. (Kretchmer—*Am. J. Obst. and Gynec.*)

the advice of Ries, that when a cervical specimen containing a leucoplakic spot is excised for examination, the spot should be marked by a small identifying suture on each side, otherwise it cannot be found in the laboratory.

The pathologic changes in leucoplakia of the cervix are: (1) hyperplasia of the epithelial prolongations, (2) changes in the cells of the epithelial layer, and (3) round cell infiltration in the underlying tissue.

1. Hyperplasia of the projections normally found at the junction of the epithelium with the underlying tissue is seen early in leucoplakia and is characteristic of the "hyperplastic stage." The prolongations become greatly enlarged and irregular, as shown in Fig. 633, though the surface may remain

Fig. 634.—Leucoplakia of the cervix. A somewhat later stage. Note the cervical glands. Gyn. Lab.

flat. In the atrophic stage, which comes later, the epithelial layer atrophies along with the marked changes in the subcutaneous tissue, as shown in Figs. 634 and 635.

2. The changes in the cells of the epithelial layer are described by Ries as follows:

The cells of the leucoplakia are packed densely, they take deeper stain in their protoplasm and in their nuclei, they are more irregularly arranged than in the normal stratified epithelium. Their basal layer is different from the normal basal layer in shape and staining quality. Protoplasmic bridges between the cells of the malpighian layer are less frequent and less pronounced. At the border of the leucoplakia there is a complete change which surprises the observer by its abruptness in a sharp, usually vertical, line extending

from the base to the surface (Fig. 636). In the leucoplakia the very last basal cell toward the normal tissue produces a totally different generation of cells from those starting out from the first and all other basal layer cells of the normal epithelium.

These cell changes are shown in Figs. 635 to 639, and also in other photomicrographs given later under the Differential Diagnosis of Cancer of the Cervix. A characteristic junction line where a leucoplakic epithelium meets the normal epithelium is shown in Fig. 636. The cell changes of leucoplakia of the cervix correspond very well with the cell changes found in leucoplakia of the external genitals (leucoplakic vulvitis), shown in detail in Figs. 354 to 359.

Many cases of leucoplakia of the cervix develop cell changes which are very erratic—so much so that they raise the question of beginning cancer.
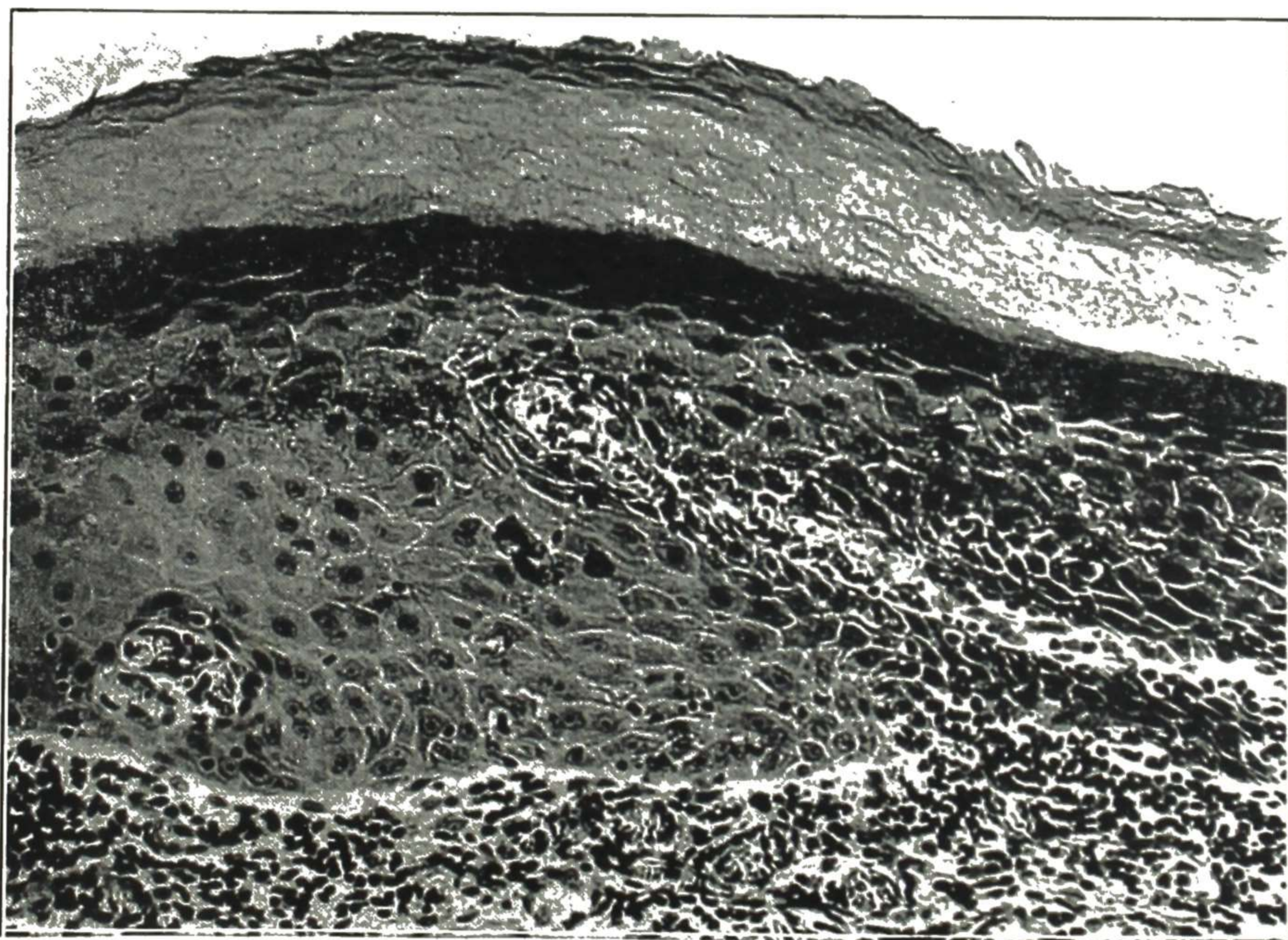

Fig. 635.—Leucoplakia of the cervix. High power of Fig. 634. Note the similarity of this to leucoplakia of the vulva (Fig. 358). At the top is the hyperkeratinization, beneath this is the dark layer made up of eleidin cells. A marked round cell infiltration is seen beneath the flattened prolongation of epithelium. Gyn. Lab.

Martzloff states, "The epithelial changes in some leucoplakic plaques have all the cytologic characteristics of cancer but lack the attribute of invasion." He presents Figs. 637 to 639, to show the cell changes referred to, Fig. 640 being given for comparison with the epithelium of normal repair in chronic cervicitis and erosion.

In regard to tendency toward malignancy, some workers claim that leucoplakia of the cervix is not a precancerous lesion. But Hinselmann states that all leucoplakias observed for a long enough time have become malignant, and he cites six cases. As mentioned above, Martzloff states leucoplakia may present all the cytologic characteristics of malignancy, but makes the point that technically an epithelium with such changes cannot be positively designated

as cancerous until there is invasion, as there is always the possibility that the erratic cell activity may stop short of this last and decisive attribute of malignancy.
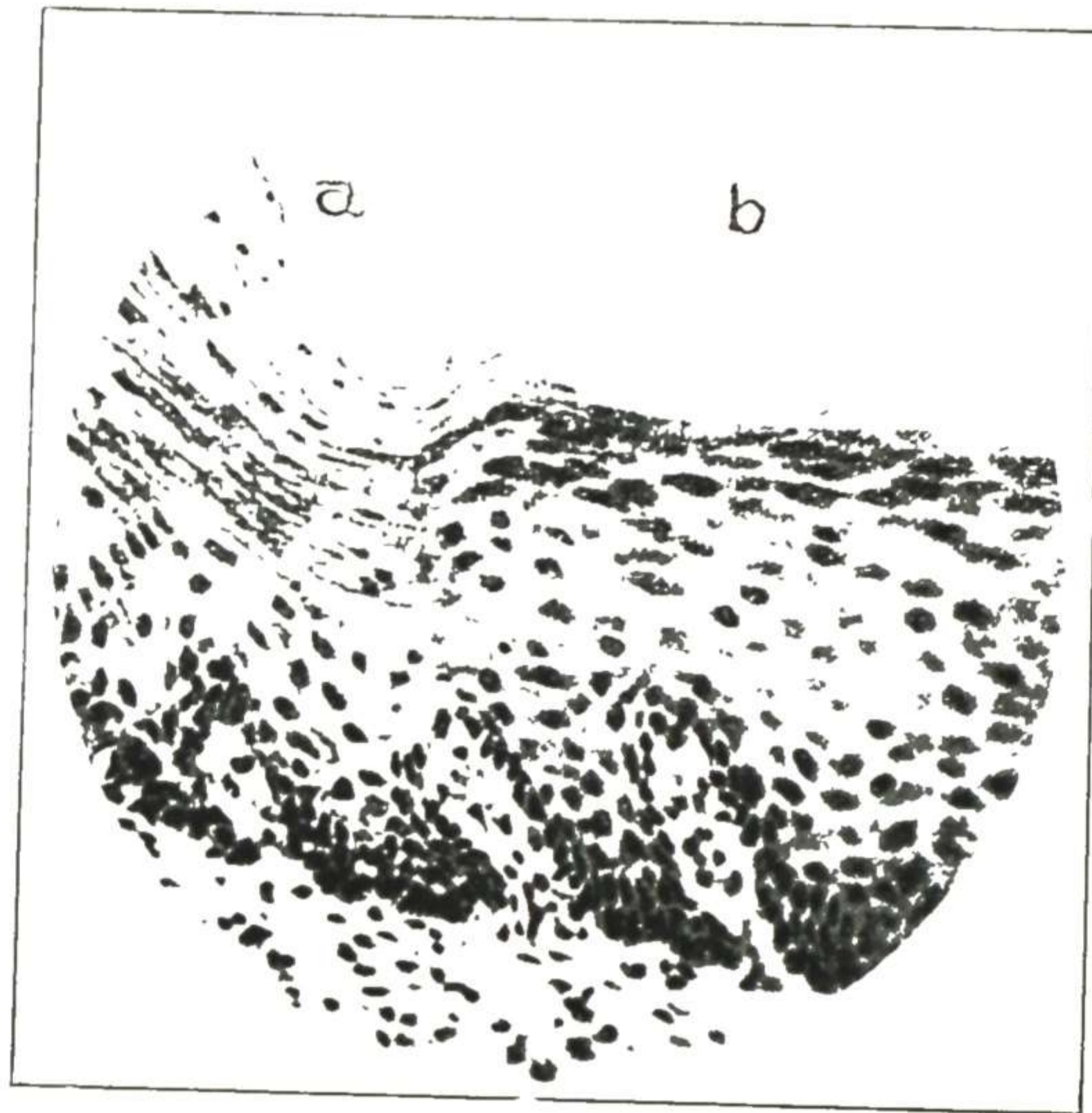

Fig. 636.—Photomicrograph of margin of leucoplakia. Under *a* the epithelium appears essentially normal and shows various cell layers. Note sudden transition to *b* which represents the leucoplakia. Here cells are compact, spinal cell layer is not discernible and the dark appearing cells near the surface represent a stratum granulosum. (Martzloff after Esser—*Am. J. Obst. and Gynec.*)
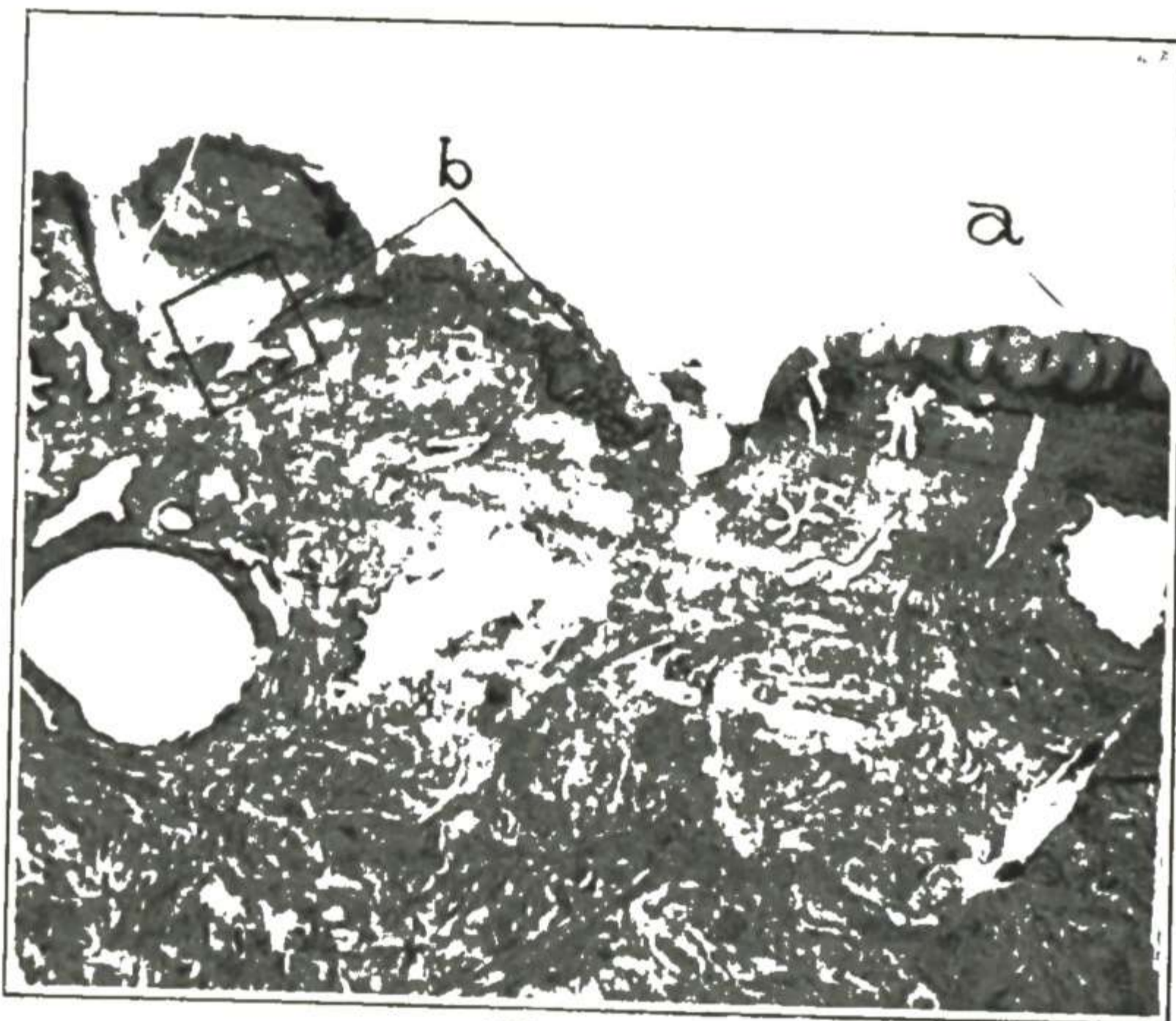
Fig. 637.

Fig. 638.

Fig. 637.—Leucoplakia. At *a* is essentially normal cervical epithelium with some underlying glands. The depression between areas *a* and *b* is lined by a single layer of columnar epithelium and represents a portion of a cervical gland. Epithelium at *b* shows pronounced alteration. The papillae are very irregular, show a tendency to clubbing, and apparently are increased in number. In right half of *b* an occasional area shows some stratum corneum and a few superficial granular cells are present suggestive of a fragment of stratum granulosum. Layer formation is not entirely lost, for some areas show a thin layer of spinal cells. Generally there is marked irregularity in size, shape, and staining reaction of the cells. There are numerous spindle cells, mitotic figures, and some epithelial whorls. Left half of *b* shows gland partially filled with stratified epithelium. (Martzloff—*Am. J. Obst. and Gynec.*)

Fig. 638.—From the blocked area in Fig. 637. At *a* are large multinuclear cells. At *b* is the remnant of a cervical gland. The majority of the cells in this area are of the spinal cell type but show most unusual irregularity in shape and staining reaction. Mitoses are present. (Martzloff—*Am. J. Obst. and Gynec.*)

The question as to whether or not cells presenting such marked erratic activity are already on the way to invasive development and should be considered and treated as cancer is taken up under the Diagnosis of Cancer of the Cervix. There additional points are illustrated by slides, one of which shows a leucoplakia with erratic cell changes, pronounced benign, which ten months later was invasive cancer.
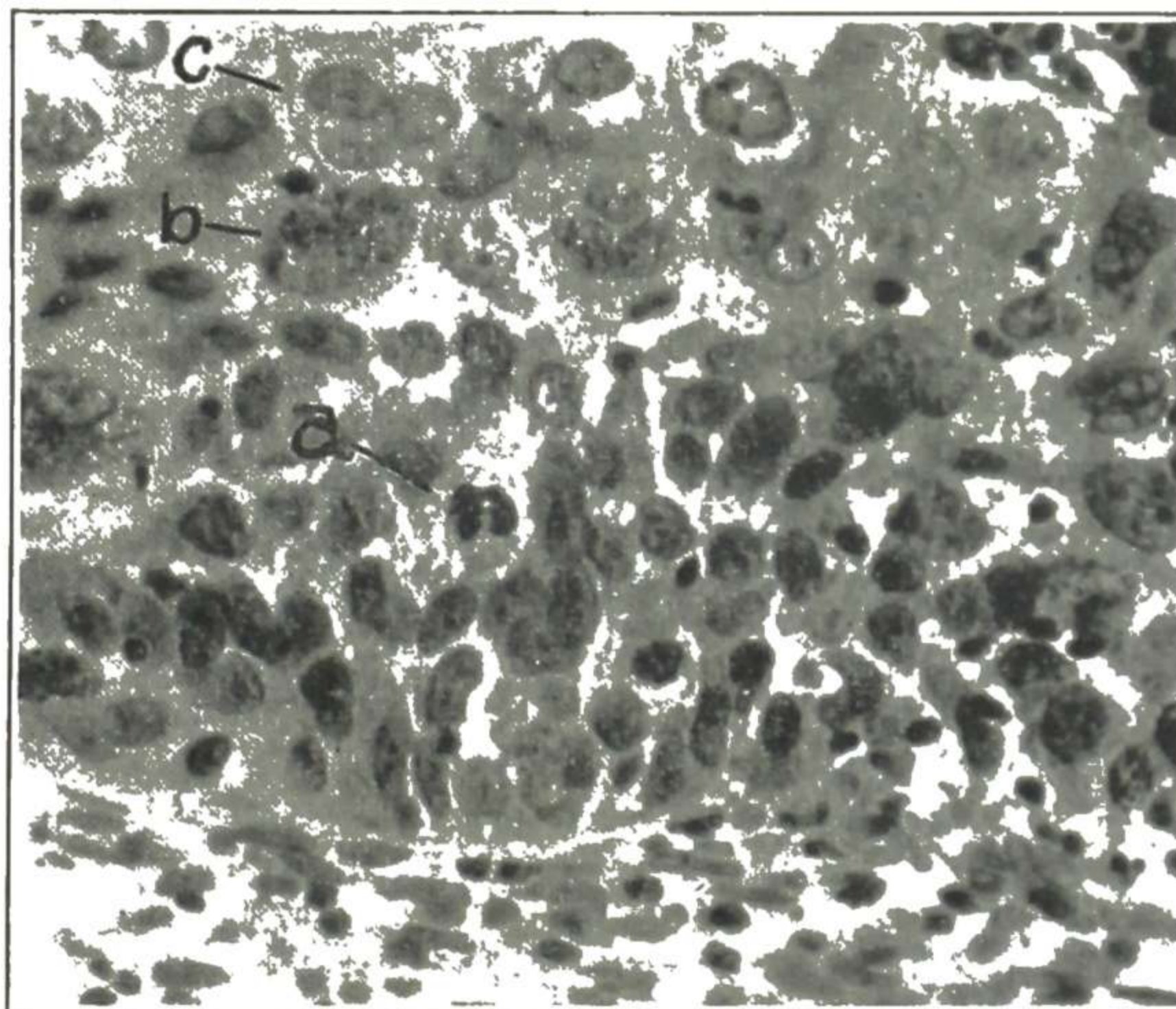
Fig. 639.—From the blocked area in Fig. 638. This shows the marked cellular irregularity. Mitotic figure at *a*, huge, coarsely granular oval cell at *b*, and large multinuclear cell at *c*. (Martzloff—*Am. J. Obst. and Gynec.*)
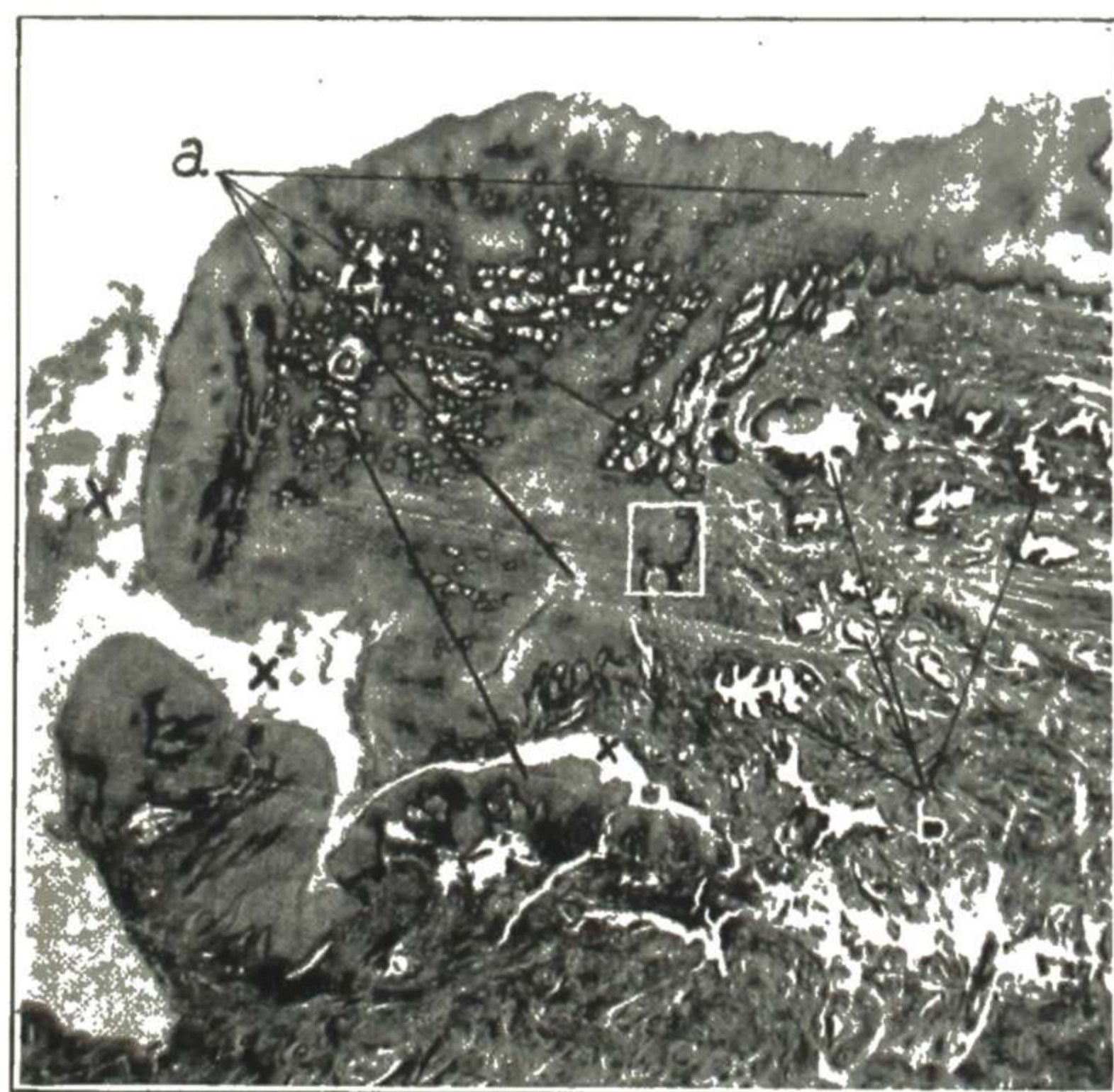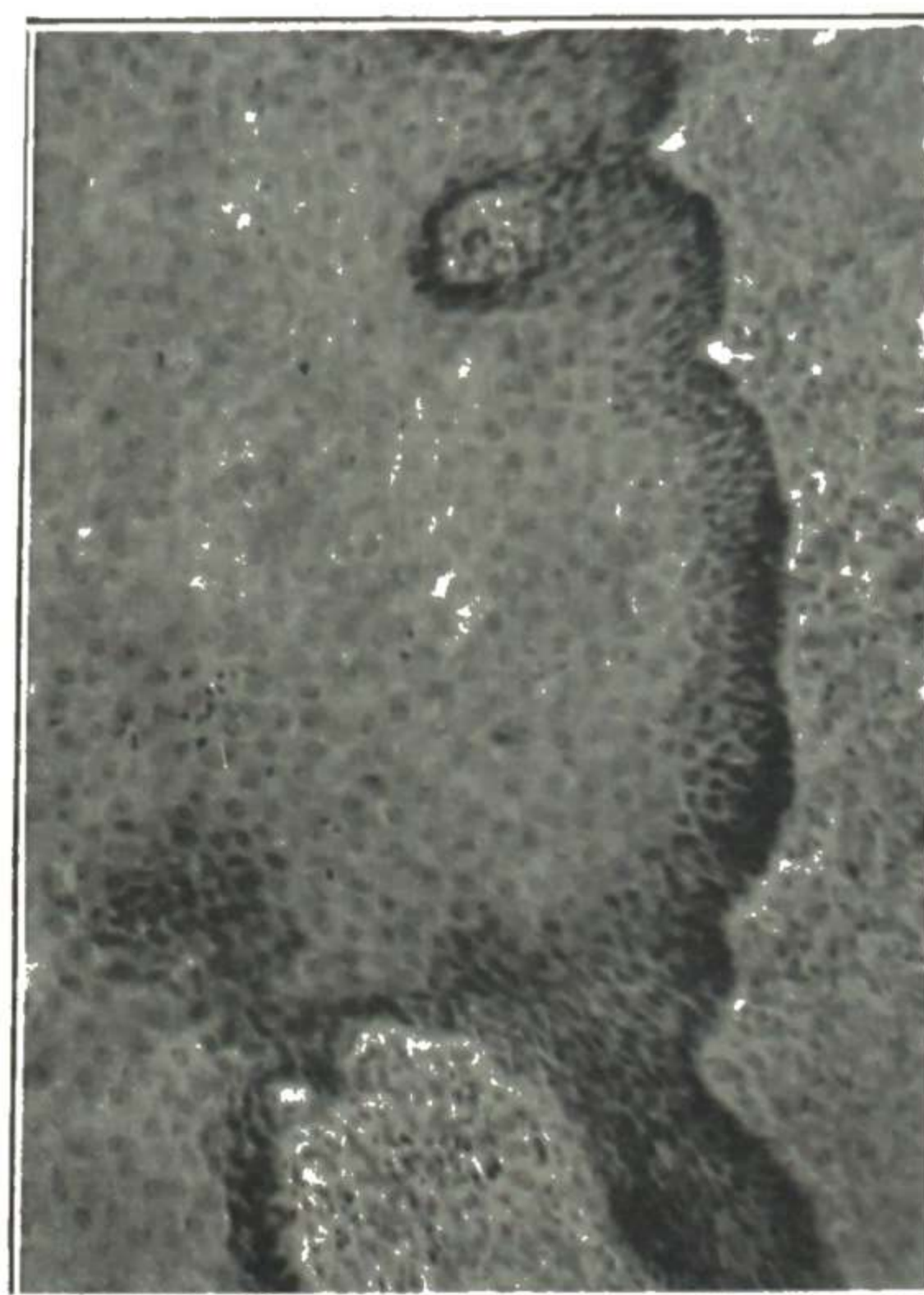
A.   B.

Fig. 640.—*A*, Healing erosion for comparison with leucoplakia. Hyperplastic epithelium with uniform cells, regular layer formation, and no mitosis shown at *a*. Cervical glands, one of which is partially lined with stratified epithelium, *b*. Cervical canal, *x*. *B*, High power of blocked area seen in *A*. Note the uniform size, shape, and staining reaction of the cells. (Martzloff—*Am. J. Obst. and Gynec.*)

Leucoplakia of the cervix should be promptly removed, the same as any other area of chronic irritation. There is likely to be associated irritation in the form of erosion or cyst formation, and the whole affected area should be

removed by conization or conical excision. In this connection it is to be remembered that when the specimen is removed, the color distinction disappears. On this account it is important, before removing such a specimen, to mark the leucoplakic area with one or two small sutures just outside the boundary; otherwise it may be missed in the laboratory.

Symptoms and Diagnosis of Chronic Cervicitis

The principal symptom of chronic cervicitis is chronic vaginal discharge. Associated with this, but due principally to accompanying lesions (laceration of pelvic floor, uterine and adnexal inflammation), there may be a sense of weight and dragging in the pelvis and also backache. Most of the cases of very persistent free leucorrhea are due to chronic cervicitis, though, of course, the other causes of leucorrhea must be taken into consideration. Fulkerson found cervicitis in 33 per cent of 6,483 adult women.

Chronic cervicitis must be distinguished in the first place from inflammation or other lesion higher in the uterus or adnexa. There is a tendency to concentrate attention on an obvious lesion which can be seen through the speculum, such as cervicitis and laceration of the cervix, and miss higher lesions. When present, such a higher lesion, though less obvious at examination, is usually much more important as a factor in the patient's disability. In fact, a complaint of pelvic pain and disability is an indication of some disturbance in addition to the cervicitis, and careful search should be made accordingly.

As to the local condition in the cervix, the appearance and palpation findings of chronic cervicitis are so characteristic that there is little trouble in making the diagnosis. Tuberculosis or syphilis occasionally produces a confusing lesion of the cervix and should be thought of in atypical conditions there. A young married woman seen recently had just moved from a distant city where she had been given a partial radium treatment for a supposed carcinoma of the cervix. The examination findings were not typical of carcinoma nor of chronic cervicitis. A Wassermann examination gave four-plus reaction, and subsequent developments showed clearly that the trouble was syphilis, treatment for which cleared the local lesion.

The principal diagnostic difficulty in connection with chronic cervicitis is the question as to whether or not there is beginning malignant disease. Chronic cervicitis, in its various forms and with its long-continued irritation, is an important factor in the development of cancer in this situation. This is readily appreciated when we consider the persistent irritation from erosion, eversion, and cyst formation, with the resulting proliferative cell changes in this danger area where two types of epithelium meet.

Carcinoma of the cervix develops usually on a base of chronic cervicitis. No one can tell when the malignant development starts, for the microscopic change produces no symptom or sign in the really early stage. When appreciable induration or ulceration appears, cancer cells have already penetrated deeply—usually to the outlying portions of the pelvis. This important subject is taken up in detail under Cancer of the Cervix (Chapter IX) and hence it is not necessary to deal at length with it here. Suffice it to say that no

time should be wasted watching chronic cervicitis for evidence of cancer. The affected area should be eliminated promptly by appropriate treatment, before cancer develops.

The cancer-preventing results already definitely attained by such treatment are encouraging. Craig found that in 2,895 cases of cervicitis treated adequately and then followed for a period of ten years or more not one case of cancer of the cervix developed. Camperman estimated that cancer of the uterus is found in 4 per cent of all gynecological patients, and Frankl found that 89 per cent of uterine cancers are in the cervix. Consequently, in this one series of 2,895 cases followed, cancer of the cervix was prevented in 112 women.

Treatment

The treatment required for chronic cervicitis varies with the extent of the lesion. The following is a satisfactory plan for handling the different grades, advancing from the smaller to the larger lesions:

1. Puncture of cyst and astringent applications.
2. Linear cauterization.
3. Office conization.
4. Hospital conization, with added suture in some cases.
5. Conical excision with knife and extensive suturing.

A.   B.   C.
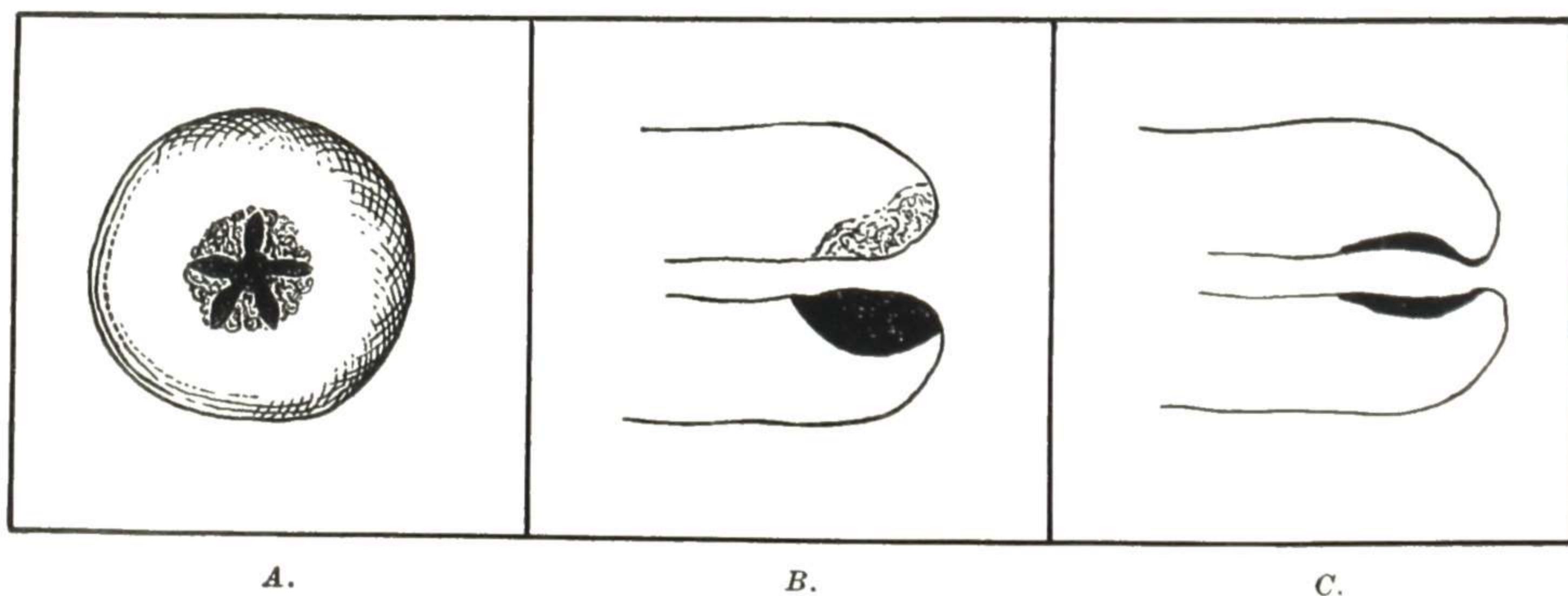
Fig. 641.—Linear cauterization of the cervix. A, showing the cautery incisions, and also the type of lesion suitable for this treatment; B, showing the deepening of the cautery incisions on the inside, so as to secure inversion from the scar contraction; C, indicating the satisfactory overcoming of the eversion, by the drawing-in effect of the inside scars.

1. **Puncture and Applications.**—When the cervicitis involves only a very small areas about the external os and the eversion is apparently kept up by a cyst or two, puncture of the cysts and an astringent application rubbed into the cyst cavities will sometimes clear the trouble and cause retraction. Astringent douches aid the process. Douches should be given often enough to prevent the accumulation of irritating discharge.

2. **Linear Cauterization.**—If the above treatment does not prove sufficient, or the small lesion is not of a type likely to yield to it, linear cauterization may be indicated. The condition most likely to yield to linear cauterization is the small eversion, the chronic inflammation being kept up by the eversion exposing the single-layered mucosa to vaginal irritation.

This treatment is carried out with the ordinary small cautery outfit, using a thin nasal cautery tip. A few radiating incisions are made, two to five, as thought necessary to draw in the everted area, by the contracting scars. Fig. 641, *A* gives a very good idea of the incisions and of the type of lesion suitable for this treatment. Care must be taken to make the cauterization incisions in such a way that the contracting scars will be effective in overcoming the eversion. To accomplish this, the inside part of the incision should extend rather deeply from the canal, as shown in Fig. 641, *B,* and the outside part
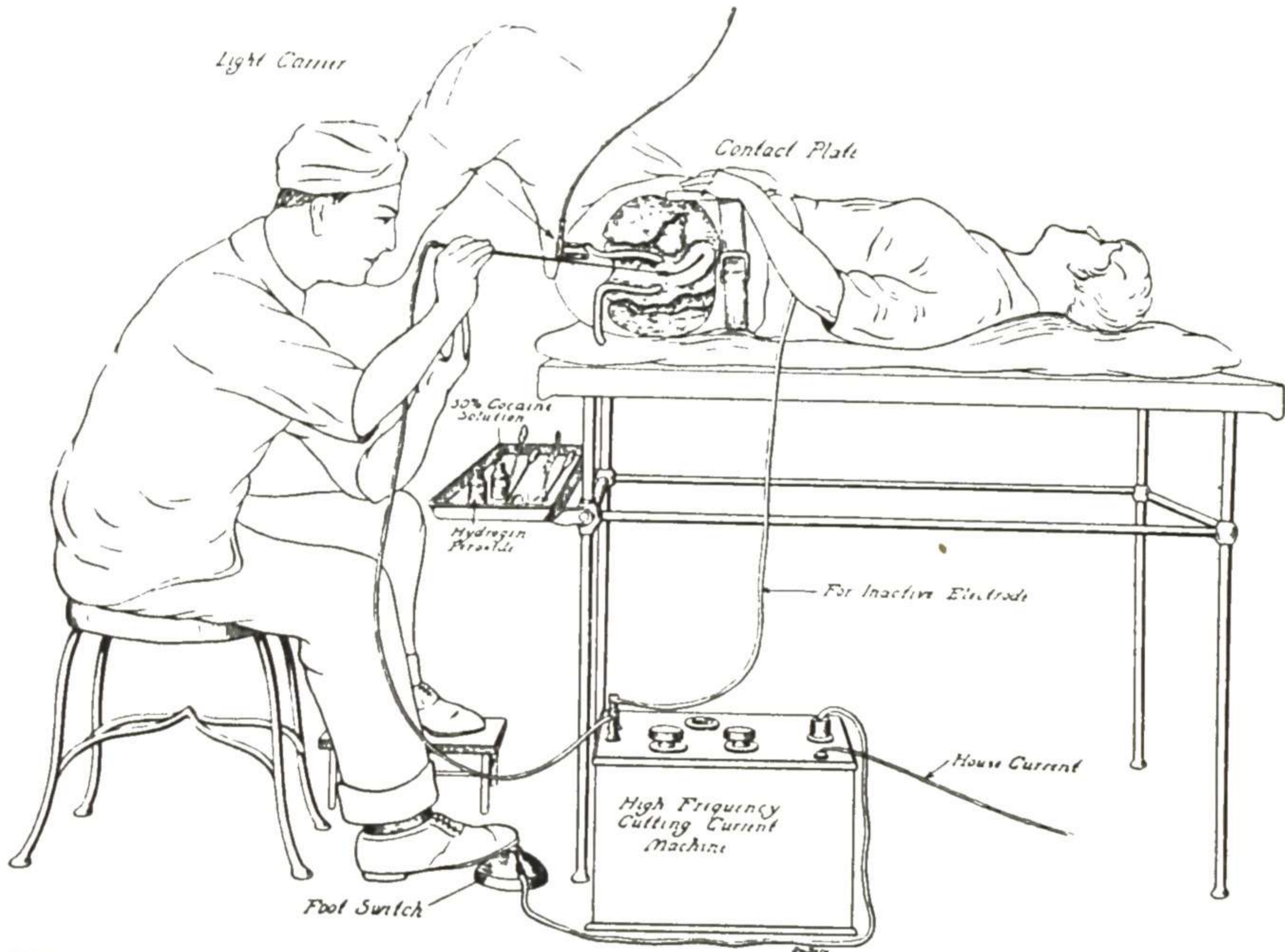
Fig. 642.—Schematic drawing of surgeon and patient during conization. (Hyams—*Am. J. Obst. and Gynec.*)
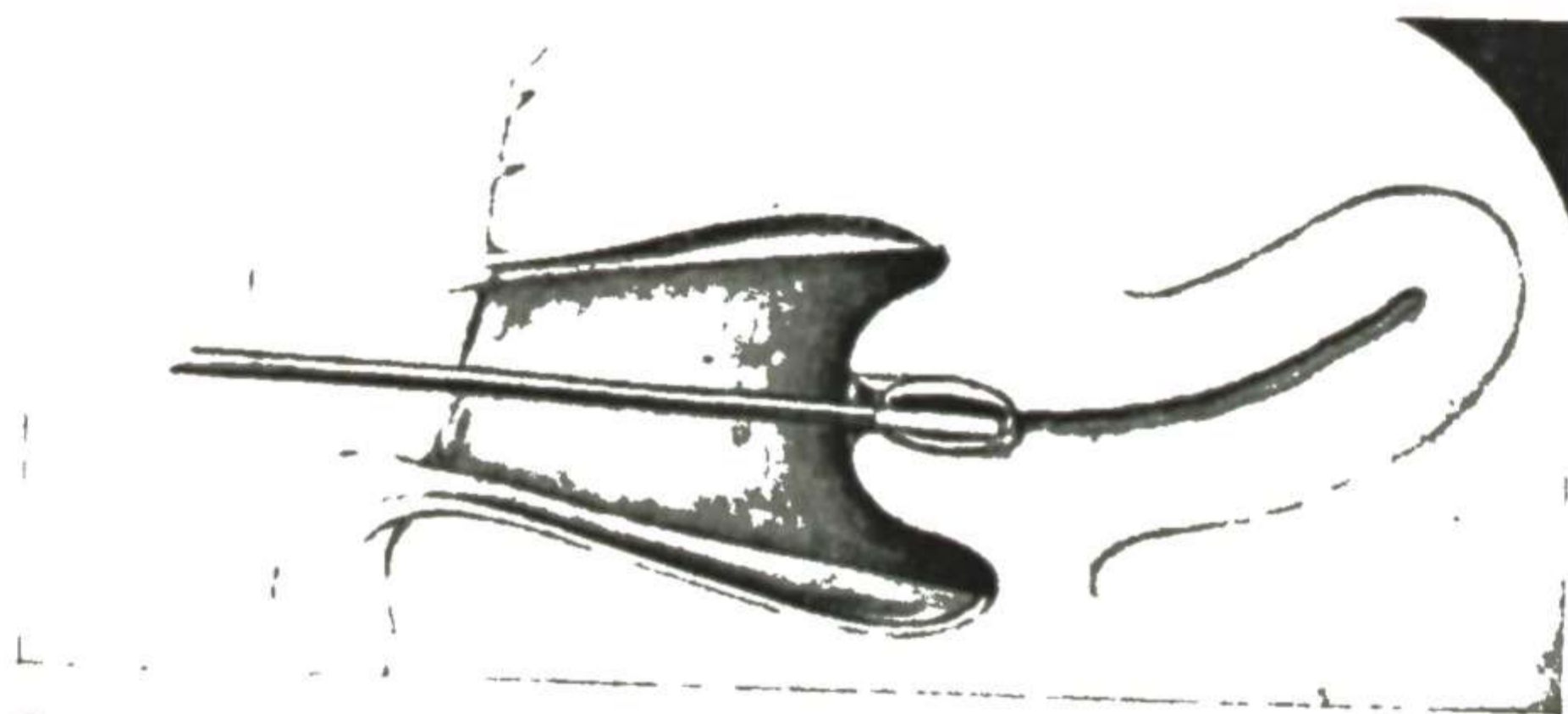
Fig. 643. Hyams electrode in cervical canal. (Hyams—*Am. J. Obst. and Gynec.*)

should be limited to the involved area, so that all the contraction will be inside, as indicated in Fig. 641, *C.* If the incisions are extended too far out on the vaginal surface of the cervix, the outside contraction may prevent satisfactory inversion. Of course, any cysts present are punctured by the cautery.

There is ordinarily no pain from these small cautery incisions, and if they have good effect, additional ones may be made for any remaining small everted area. In making any additional incisions, avoid the new scars which are sometimes hypersensitive.

3. **Conization.**—If the small lesion of the type mentioned does not yield to the treatments given, it may be eliminated by office conization. This simple and satisfactory method of treatment was originated by Hyams and elaborated and the results reported by him in several articles. The general arrangements for conization are shown in Fig. 642, and the shape of his electrode and its position in the cervix are shown in Fig. 643. Hyams gave special emphasis to the removal of the endocervical mucosa. He shaped his electrode and technique accordingly and insisted that the removal of tissue should be limited to that within the canal and to the ⅛ inch width of his electrode.

In a study of these cases in conjunction with the use of the Hyams electrode one of us (R. J. C.) became convinced that a wider excision would be a marked advantage and devised an electrode for that purpose.
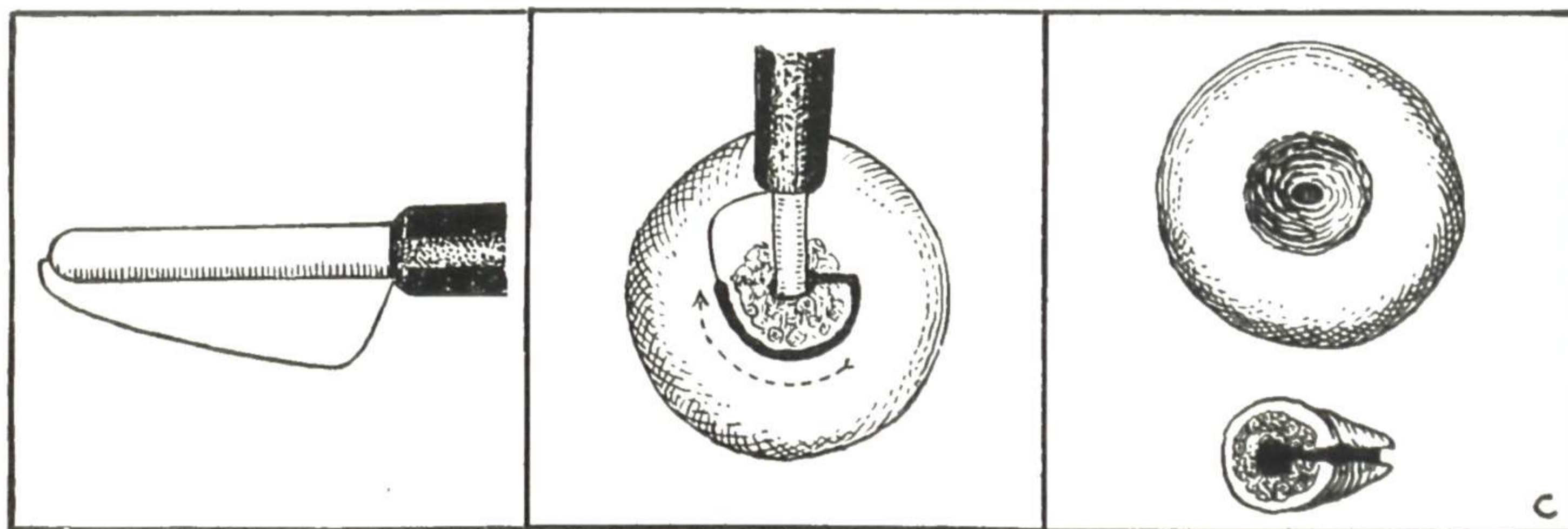
Fig. 644.   Fig. 645.   Fig. 646.

Fig. 644.—The new electrode for wider conization.

Fig. 645.—Indicating the method of using the electrode, i.e., a wide excision taking in all of the affected area.

Fig. 646.—The excised cone of tissue; also, the remaining funnel-shaped cavity, which heals rapidly with good inversion. (R. J. Crossen—*J. Missouri M. A.*)
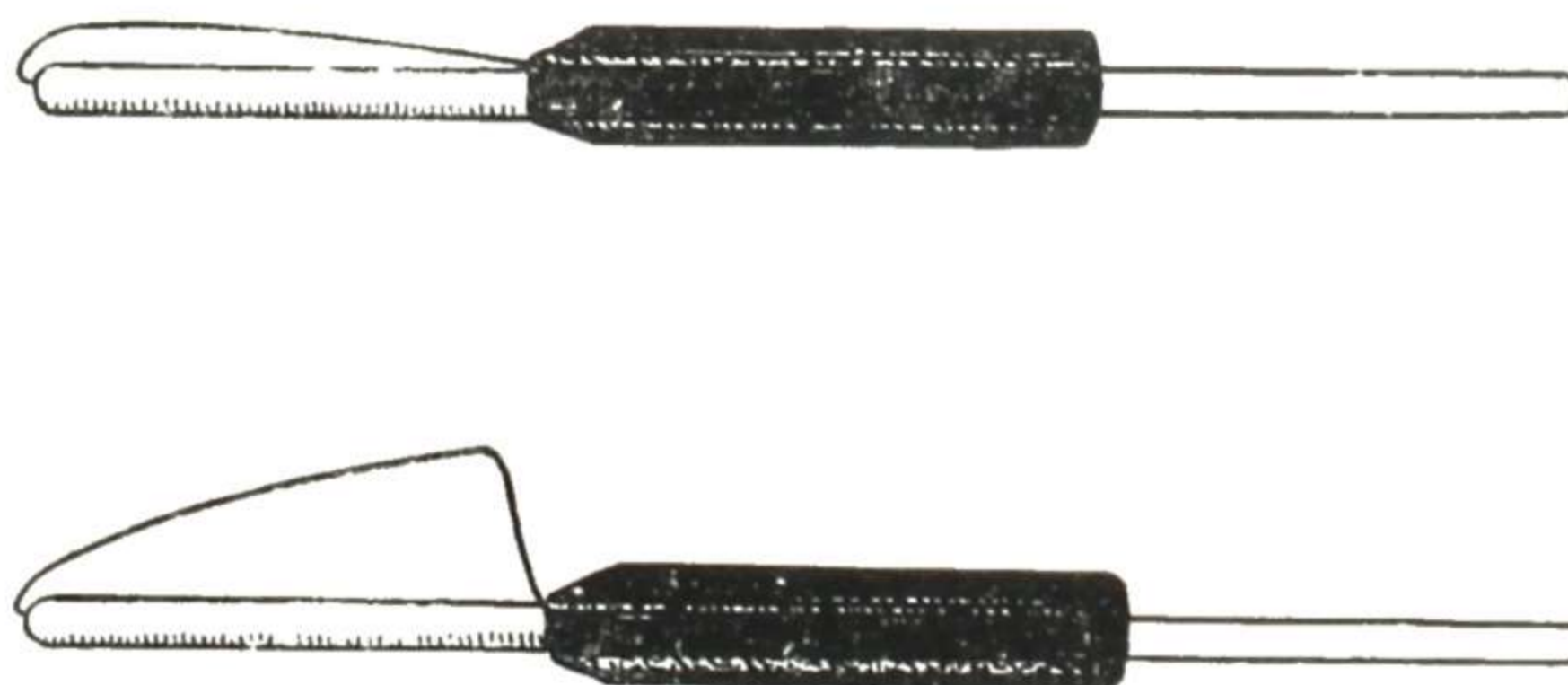
Fig. 647.—Upper electrode a Hyams, wire is one-eighth inch from the central core. Lower electrode is a medium-sized Crossen used for the wide conization to include all of diseased tissue. (Crossen—*Am. J. Obst. & Gynec.*)

The details of this electrode and its action, and our use and experience with it in office and hospital work, are given in the article, A New Electrode for Conization of the Cervix, from which the following quotations are taken:

While the Hyams electrode worked well in nulliparous cases, it was not satisfactory in cases of eversion with wide erosion and cyst formation. Its cutting wire was too close to the silicon tube to allow removal of a good-sized cone of tissue, including all the infected area. In order to overcome this difficulty there was need of a different type of electrode. I drew some sketches of the kind desired and wrote to various diathermy firms but they had none. Finally one of the firms offered to make up some according to specifications, for trial. After experimenting with different ones, the type shown in Fig. 644 was found to accomplish best the desired excision.

The point of the active electrode is placed in contact with the cervix so that the silicon tube will go into the cervical canal as the cutting proceeds. The foot switch is then closed and the electrode introduced into the canal to the desired depth, and then rotated as shown in Fig. 645, removing a cone of tissue (Fig. 646). This electrode is shown in comparison with Hyams' in Fig. 647.

The advantages of this electrode and technique are as follows:

1. It enables one to remove all the infected tissue about the external os, including cysts extending outward on the surface.

2. It gives a larger piece of tissue for pathologic diagnosis. Also, the specimen includes the area where the columnar epithelium of the erosion extending outward meets the squamous epithelium, which is the area where carcinoma is most likely to start.

3. It extends the hemostatic cutting-current excision to a large group of cases formerly considered too extensive for it.

This larger group includes two classes of cases: first, those in which the moderate extension of the cervicitis outward from the external os can all be removed by the single rotation of the wide electrode, as shown in Fig. 646 and, second, those requiring additional turns of the electrode, as in Fig. 648, A, to remove more extensive infiltration and cyst formation.
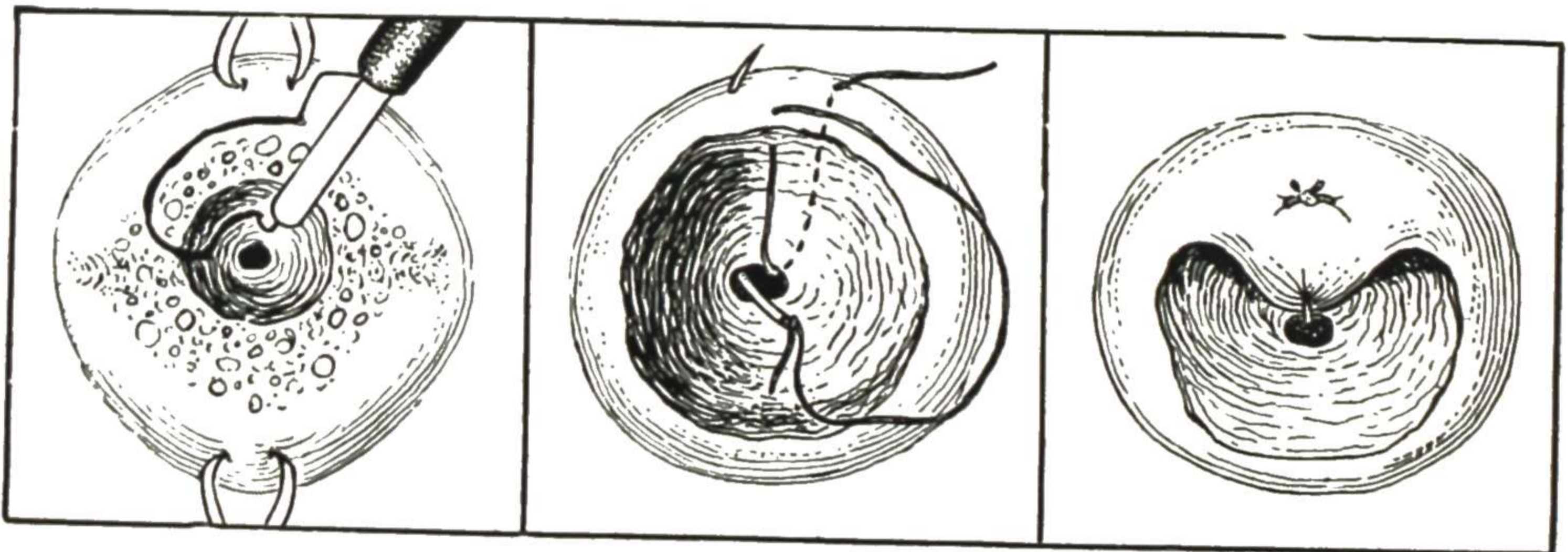
A.   B.   C.

Fig. 648.—Very extensive conization, with use of a Sturmdorf suture on anterior lips to aid inversion during healing. A, the second round of tissue excision, after regular central conization; B, passing the Sturmdorf suture in the anterior lip; C, the first suture tied, showing the inverting effect. This also shows the open area left at each side, giving plenty of drainage opening for each flap. For hemostatic effect, the entrance and exit of the Sturmdorf suture should be separated about twice the distance shown in B. An additional Sturmdorf suture may be placed wherever needed for good inversion or hemostasis.
To maintain a wide canal it is well to introduce rubber tubing with a T-arrangement at the upper end, to prevent slipping out of canal, and at lower end to prevent slipping inside the uterus. (Crossen and Crossen—Operative Gynecology.)

In these extensive cases it was thought that inversion and rapidity of healing might both be facilitated by turning in the anterior and posterior lips with a Sturmdorf suture, as indicated in Fig. 648, B and C. The idea is not to make complete approximation of the raw surfaces as in conical excision with knife and sutures, but simply to start the inversion by drawing the outer margin well in by a single chromic catgut Sturmdorf suture in each lip. This suture also controls any bleeding tendency.

Hospitalization as for regular curettage is advisable in most cases requiring conization. Curettage also is frequently needed in these patients and at times other operative treatment which can be taken care of in association with the conization, such as radium treatment for myoma and plastic operations for cystocele, rectocele or relaxed floor.

In a later paper by R. J. Crossen and G. J. L. Wulff reporting three hundred conizations, they report also an improvement on the Crossen electrode by T. K. Brown. Instead of the fragile silicon central core Dr. Brown substituted a brass tube covered with insulating material. He also arranged the cutting wire so that it could be easily replaced, thus eliminating the necessity of sending the electrode away for repairs. These improved electrodes, which are almost unbreakable, are shown in Fig. 649.

Attention is called to the fact that the inverting suture, shown in Fig. 648, has been found very useful in hastening inversion and rapid healing. For good hemostatic effect, the entrance and exit points of the suture are separated sufficiently to include a large area of tissue between them. The suture material used is 40-day No. 1 chromic catgut.

From our experience we feel that sutures should be used in the following types of cases: (1) Wide conization where there is a good deal of eversion, regardless of whether they bleed at the time or not. (2) When there are bleeders at the time of conization. (3) When radium or a stem pessary is used. If the eversion is marked laterally or there is lateral bleeding, lateral Sturmdorf sutures can be used in combination with the anterior and posterior ones.
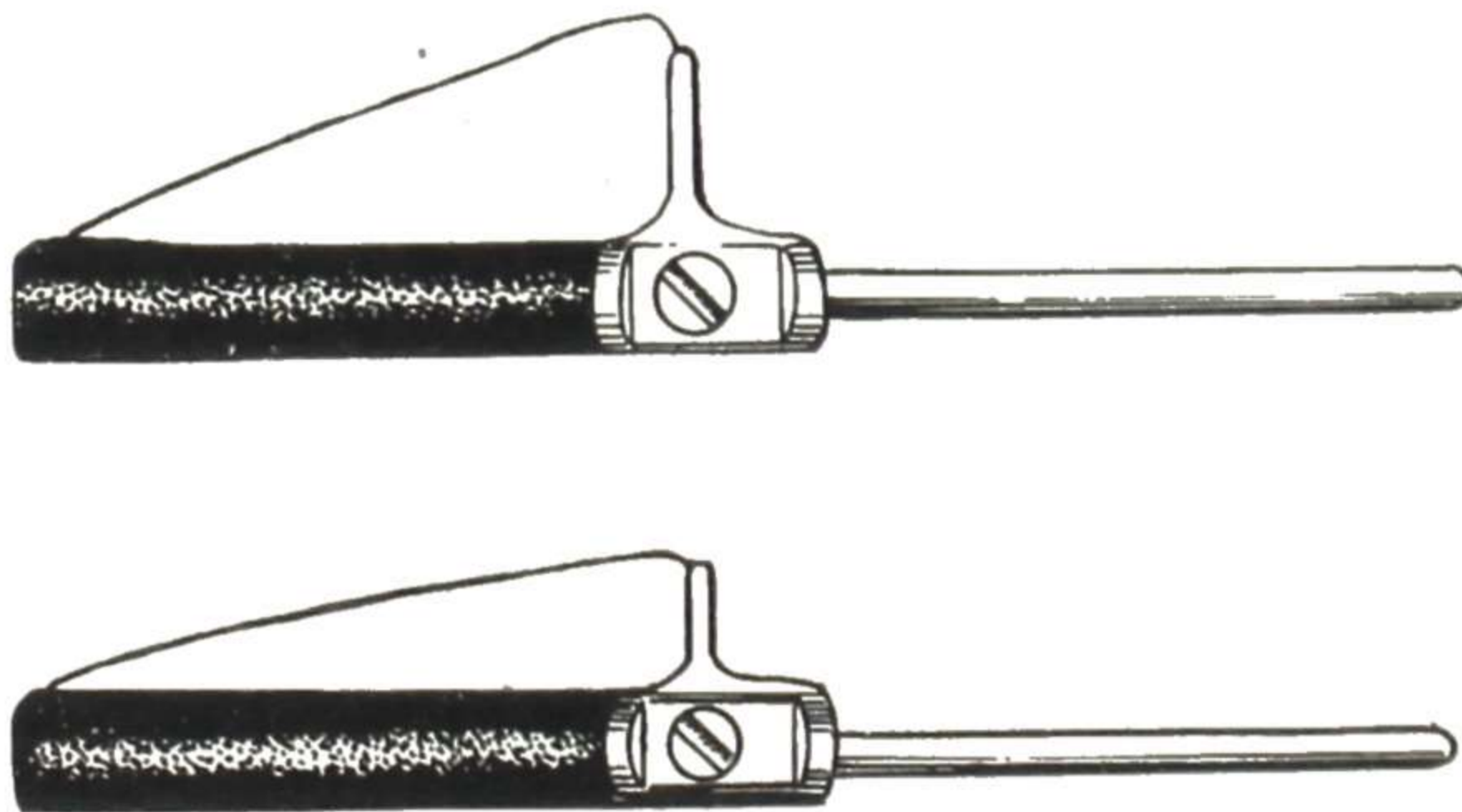
Fig. 649.—T. K. Brown modification of Crossen electrode. The unbreakable central core and replaceable cutting wire increase the durability of the electrode and reduce repair costs. (Crossen—*Am. J. Obst. & Gynec.*)

The use of the suture has allowed us to cone the more extensive cases of cervicitis, the type we used to feel needed the regular Sturmdorf operation, so that we now use the Sturmdorf operation only in cases requiring plastic repairs because of tears into the parametrium. The conization prevents most of the troublesome bleeding at the time of operation, and the removal of the infected tissue is ordinarily done more easily with the electrode than it is with the knife so that the time required is shortened.

This type of conization is very useful in removing chronic irritation from the cervix in cases of abdominal hysterectomy where for some reason it has been found advisable to do a supravaginal instead of the contemplated complete hysterectomy. After the abdomen is closed, the patient is arranged for vaginal work, and the irritated area about the external os is coned out, taking care to avoid deep penetration into the cervical stump. It has been found to work in well also with other operations, such as curettage, repair of the pelvic floor, and cystocele and prolapse operations.

In extensive conizations it is well to insert a tube drain past the internal os with T projections on each end to hold it in place. This is ordinarily left for several days, being removed in the regular examination just before discharge from the hospital. After some weeks, when the patient returns for the postoperative check-up, the canal is explored with a moderate-sized dilator to see that it is well open.

The tube for the cervical canal is a small item; but unless managed properly it may cause trouble, particularly if it is missing when the time comes to remove it. Has it slipped from the cervix and been washed out with the douche, and thrown away unnoticed, or has it slipped into the endometrial cavity? Those who have experienced this situation appreciate that it means anxiety for the physician and trouble for the patient. To prevent this occurrence two measures are advisable. 1. Make T projections, as shown in Fig. 650, on *each* end of the tube, to prevent it from slipping up or down. 2. Use
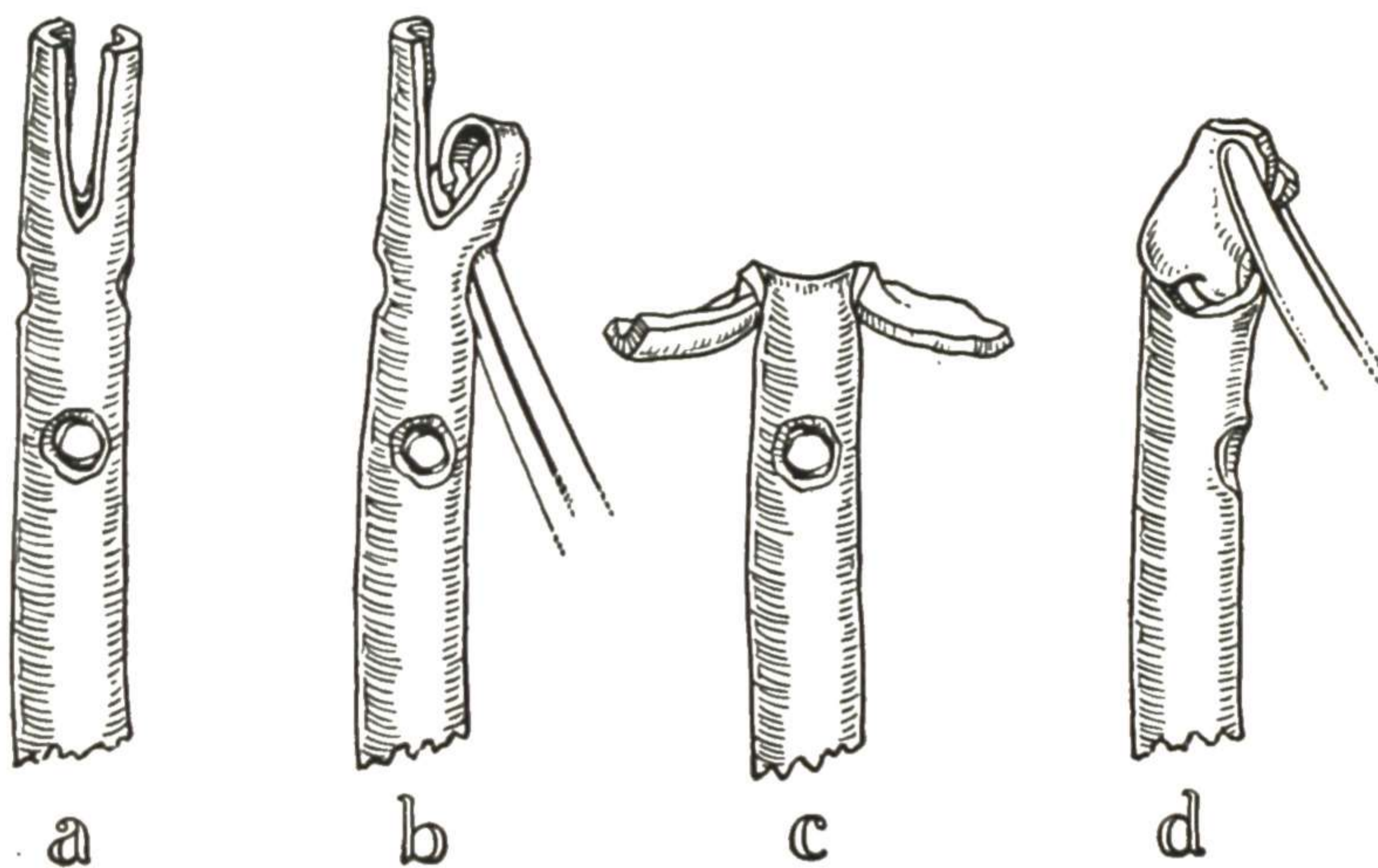
Fig. 650.—A good method of arranging the drainage tube to keep it from slipping out of the abscess cavity. *a.* The end of the drainage tube, showing the split in the end and the small opening at the base of each flap. *b.* Drawing one of the flaps through the opening at its base. *c.* Both flaps drawn through. *d.* The flaps bent up and grasped with forceps preparatory to introduction of the tube into the abscess cavity. (Crossen and Crossen—*Operative Gynecology.*)

red rubber tubing, which is opaque to x-ray, so that if any question arises as to whether the tube is in the uterus, an x-ray film will show its presence and location.

The black rubber tubing ordinarily used for drains cannot be satisfactorily identified by x-ray. Crossen and Scott conducted experiments on the x-ray visibility of drainage materials, and those interested will find full details with illustrations in the article. One of the results was the adoption of red tubing for the various drains used in vaginal and abdominal surgery. The four sizes of red rubber tubing adopted are shown in Fig. 651. A No. 2 size tube drain with T projections on each end is shown in place in the cervix after extensive conization, in Fig. 652.

4. Conical Excision With Knife and Extension Suturing.—This is a safe and reliable method of taking care of extensive chronic cervicitis with the usual accompanying laceration, infiltration, eversion, and cyst formation. It

was devised by Sturmdorf and was a marked advance over the methods of repair then in use. This method not only excises the whole cystic area, but also covers over the raw surfaces in a most satisfactory way by means of the special Sturmdorf suture. With improved suture materials and advances in technique, the details as carried out today differ greatly from those first used, but the principles of the operation remain the same. The two important principles are, first, removal of the whole affected area by a cone-shaped excision (Figs. 653 to 655) and, second, turning in of an anterior and posterior flap by means of the ingenious Sturmdorf suture (Figs. 656 to 658). In any method of excising the affected tissue and repairing the cervix, the danger of subsequent stenosis of the canal must be kept in mind and guarded against. The dangerous area in this respect is the region of the internal os. Fortunately, as the laceration is in the lower part of the cervix the subsequent chronic inflammation and cystic change usually affect only the lower half or two-thirds of the
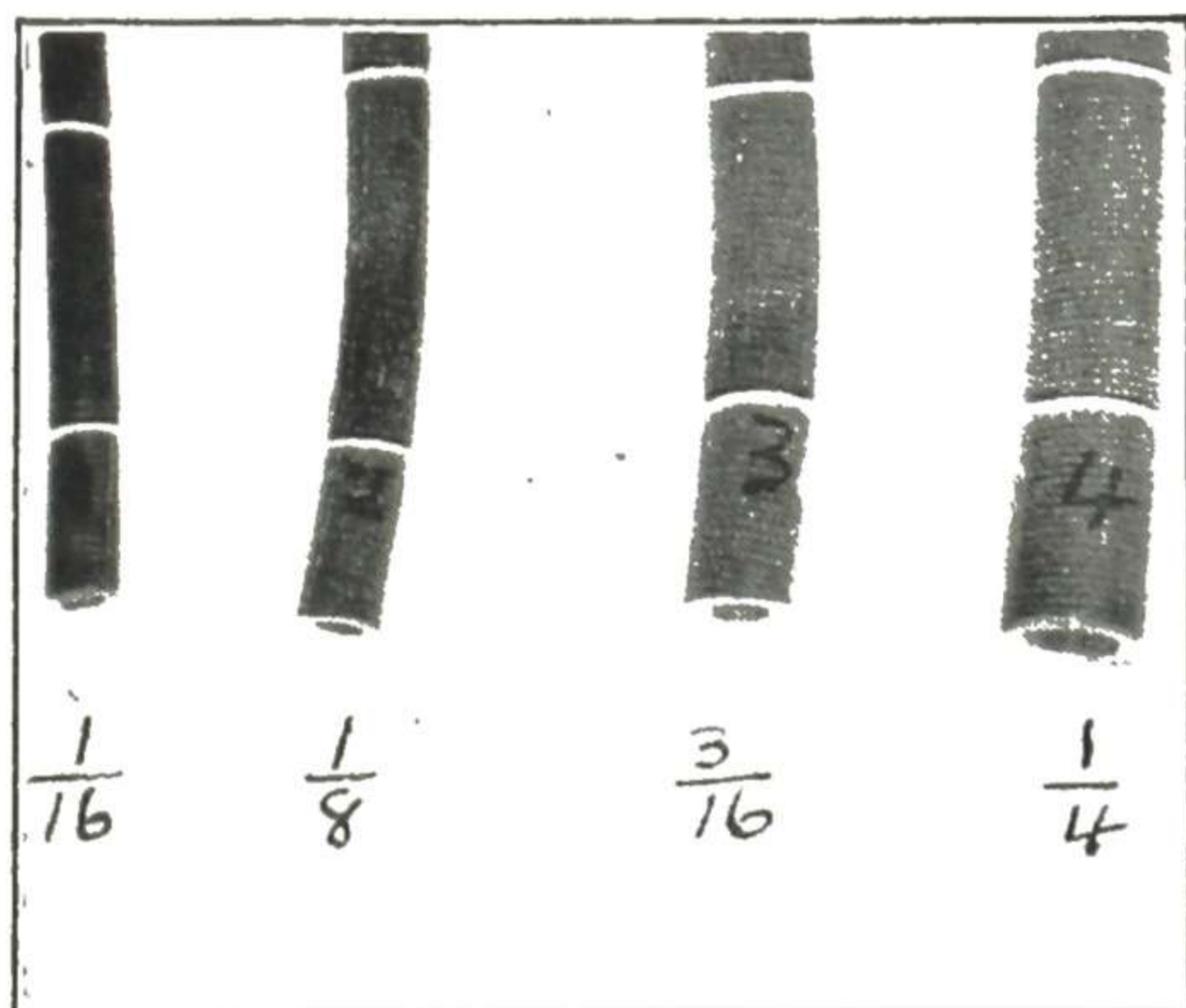
Fig. 651.   Fig. 652.

Fig. 651.—A photograph showing red tubing in the four sizes of tubing ordinarily used for drainage purposes. Starting with No. 1 which is the common red Dakin tubing the sizes run about as follows: Size No. 1, 3/16 inch outside diameter, order by hole 1/16 and wall 1/32 inch; size No. 2, 1/4 inch outside, order by hole 1/8 and wall 3/64 inch; size No. 3, 5/16 inch outside diameter, order by hole 3/16 and wall 1/16 inch; size No. 4, 3/8 inch outside diameter, order by hole 1/4 inch and wall 1/16 inch.

Fig. 652—A roentgenogram showing a red tube drain (size 3) in position in the cervix in a patient convalescing from extensive conization of the cervix and curettage and repair of floor. There is a T formation at the upper end as well as at the lower end but at such an angle to the film that it does not show well. (Crossen and Crossen—Foreign Bodies Left in Abdomen. The C. V. Mosby Co.)

cervical mucosa. It is quite unusual to find much cystic change in the upper third; consequently, the line of excision may be kept well away from the internal os. Laterally, also, the excision of tissue should be limited to what is necessary for removing the chronic irritation. Unnecessarily extensive excision in any direction increases the troublesome bleeding and the chance of later stenosis. In doing the operation the conical excision should include the lower half or two-thirds of the mucosa, depending on conditions, and laterally just enough to remove the cystic tissue. When the cone is out, the remaining surface is examined, and if any cyst is found it is removed.

Another item of importance is the troublesome bleeding which interferes with the work. The authors experimented in various ways, seeking the best method of control. Preliminary circular ligation of the cervix and other forms of preliminary ligation or lateral clamping interfered more or less with the excision and suturing. Pressure hemostasis of the bleeding points was
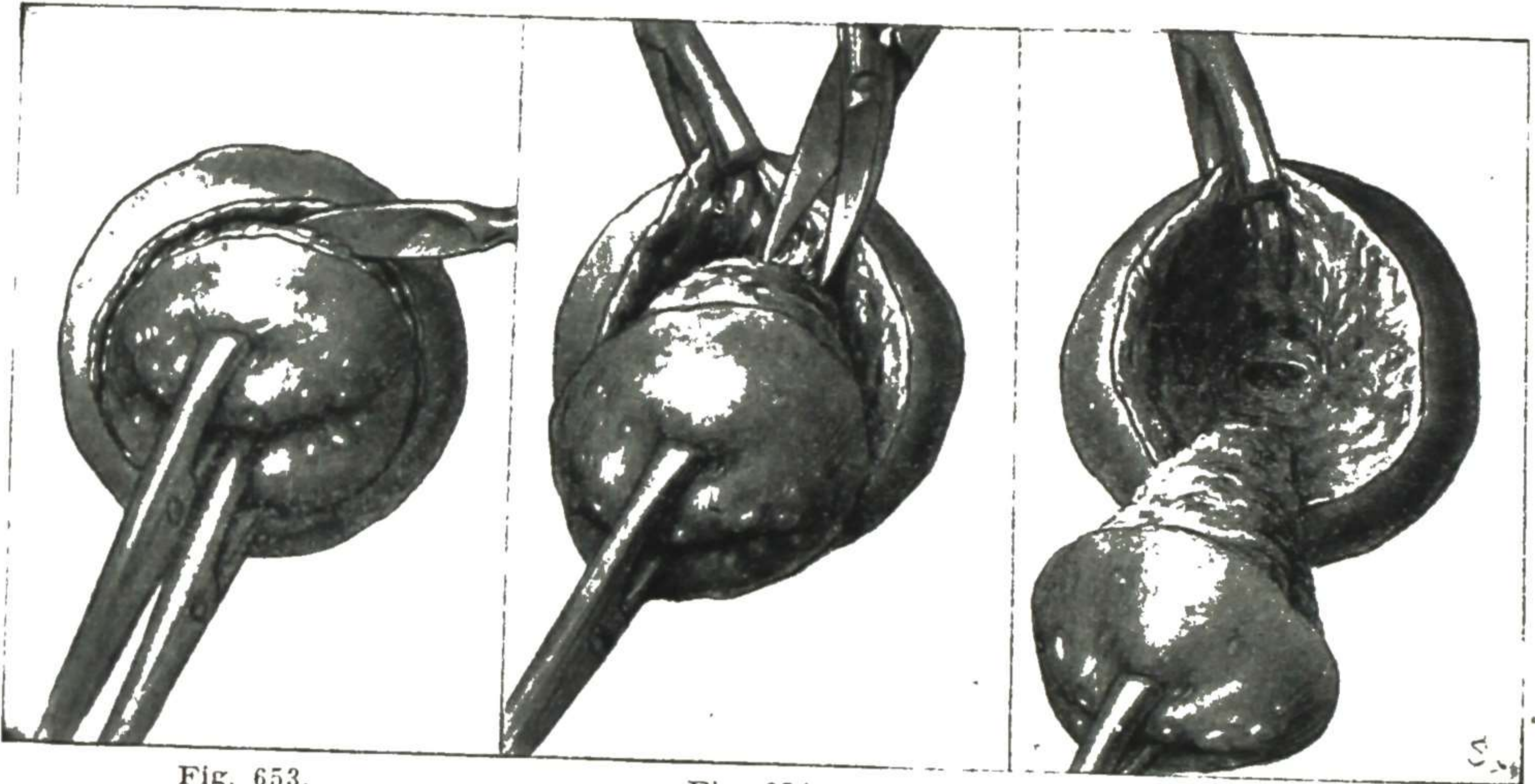
Fig. 653.   Fig. 654.   Fig. 655.

Fig. 653.—Conical excision of the cervix (Sturmdorf). Outlining the area to be removed. No more cervical tissue should be removed than is necessary to insure the removal of the chronic irritation.

Fig. 654.—Excising the deeper portions of the cone.

Fig. 655.—The cone excised, showing the resulting large raw surface, which bleeds freely. (This series of illustrations from Crossen and Crossen—*Operative Gynecology.*)
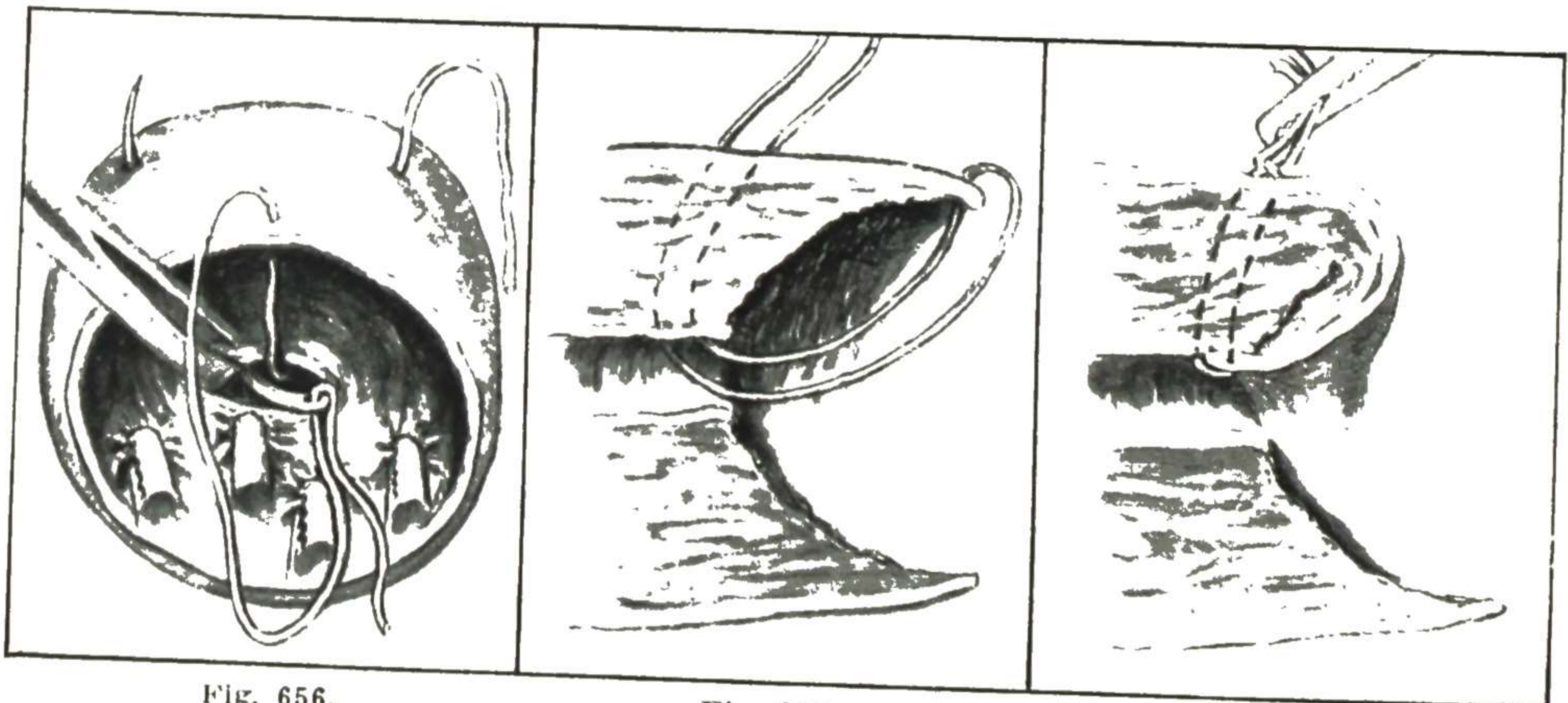
Fig. 656.   Fig. 657.   Fig. 658.

Fig. 656.—The anterior main suture has caught the anterior margin to be turned in and is being passed back from the canal to the vaginal surface of the cervix.

Fig. 657.—A sectional view showing the course of this Sturmdorf suture.

Fig. 658.—The suture tied, doubling in the thinned-out rim of the cervix as a flap over the raw area.

finally adopted. It is simple and satisfactory. Though it does not stop all bleeding, it reduces it sufficiently to permit accurate work and to obviate undue blood loss. As soon as the cone is out, the principal bleeding points are rapidly caught with strong toothed forceps. By judicious placing of the

forceps the bulk of the bleeding may be controlled, usually by six to eight. The forceps are left undisturbed a minute or two for pressure hemostasis, before proceeding with the next steps, shown in the illustrations.

In some cases, particularly where the cervix is fixed by scars, there may be difficulty in passing the main sutures in the regular way, especially the posterior suture. This difficulty may be overcome by putting a needle on each end of the suture and introducing each end from within outward through the canal. Another maneuver for overcoming the difficulty is to bring the needle out at the middle of the raw surface and then take a bite to carry the suture into the canal.

The extension of the field of conization with the high frequency wire loop, as previously explained, has obviated the necessity for this conical excision with knife and extensive suturing in all but exceptional cases. Occasionally the infiltration will be so extensive or the cervix so drawn out of shape by scars, that conical excision with the knife is preferable to attempting the

A.   B.   C.
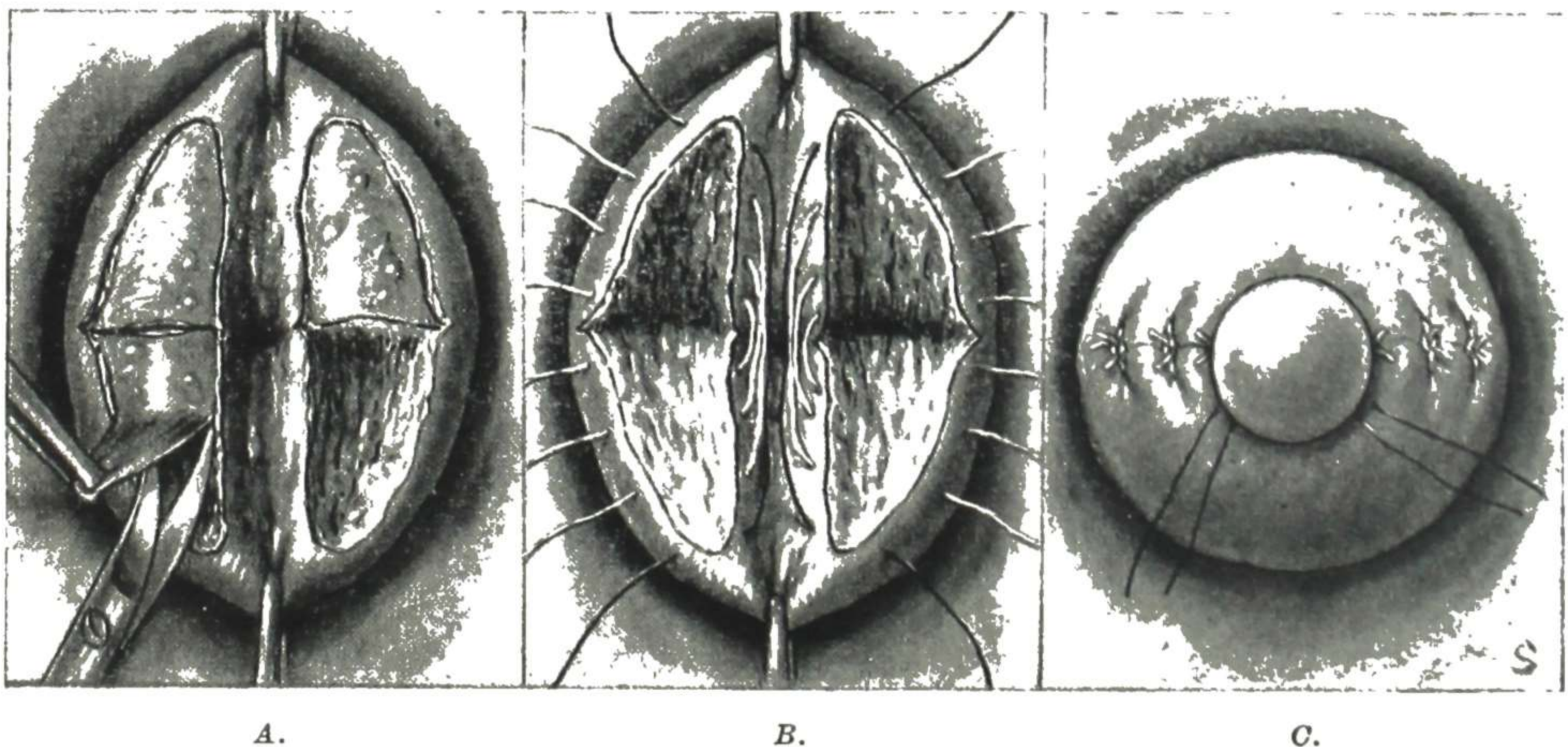
Fig. 659.—Repair of lacerated cervix (trachelorrhaphy), *A*, Denuding on each side of the canal, with more or less excision of cysts and infiltrated tissue. For this a knife or scissors may be used. A very convenient way is to start the process with the knife and finish with scissors. *B*, All sutures passed and ready to be tied. *C*, All sutures tied and the stem in place.

irregular excision with the conization electrode. In certain cases the suspicious area of particular interest may be situated in the canal, where it would not be completely excised by the deep small end of the electrode. In the case of a very vascular cervix and associated intrauterine treatment, one may feel surer of hemostasis with the extensive suturing of regular conical excision. When no satisfactory conization apparatus is at hand, one may make ordinary conical excision with the knife.

Trachelorrhaphy.—The operation of trachelorrhaphy (Fig. 659), formerly employed for the repair of the cervix in these cases, has been superseded by the more effective methods just explained. In the cases with enough pathologic change and chronic irritation to require repair it is preferable to remove all the involved tissue, instead of leaving a strip on each lip, as was necessary in the old trachelorrhaphy. Possibly there may be some exceptional cases of unilateral tear or of bilateral tear without much inflammation, in which this

lateral denudation and suture would be preferable. But it is now principally of historical interest, as an important step in the gradual development of effective treatment for this condition.

Coagulation.—Another method of removing the affected portion of the cervix is by electric coagulation, with sloughing of the coagulated tissue and subsequent granulation of the wound. This method has had a popular run, reminding one somewhat of the widespread popularity years ago of deep destructive cauterization of the cervix. The latter was finally abandoned on account of serious late results from the extensive scar-tissue formation. Whether or not electric coagulation, with its associated sloughing, will show similar results remains to be seen. For the present, it seems to run counter to an important principle of the handling of suspicious tissue in this area— namely, that such tissue should always be removed in a way which will permit of microscopic investigation of it. Of course, a specimen may be removed before the area is coagulated, but carcinoma may be beginning in another part of it. The safest plan is to remove the whole area as a specimen, and examine all of it, as is done in the other methods. Additional disadvantages of the coagulation method are extensive sloughing, occasional serious spread of infection, and the long period of healing.

Coagulation and the experimentation and clinical work connected with it constitute an important step in the long search for the best method of handling these cervix cases, and much credit is due the men who have conducted the work and carefully reported their results. The authors feel, however, that a judicious consideration of available information at this time indicates the adequacy and decided superiority of the methods advised and described in detail in the preceding pages.

Other methods of treating cervicitis have been employed, including ionization and carbon dioxide snow, but at present the methods already detailed seem definitely the preferable forms of treatment.

In cervicitis during pregnancy it would seem safest to employ palliative measures, to remove the irritating discharge and prevent aggravation of the trouble. There may be exceptional cases, however, in which the irritation is so marked that the danger of allowing it to continue would seem greater than the danger of more radical measures with the possibility of associated miscarriage. King and Touff report a series of 48 cases treated by fairly deep linear cauterization between the twentieth and thirtieth weeks of pregnancy.

ULCER OF CERVIX

An ulcer of the cervix is an area on the cervix which has lost its epithelial covering down to the connective tissue, the base being formed by granulation tissue or slough. It differs from erosion in that it is without epithelium on the surface, as shown in Fig. 660.

An ulcer in this location may be due to simple irritation or nutritional disturbance or may be due to chancroidal infection, syphilis, tuberculosis, granuloma inguinale, lymphogranuloma inguinale, or cancer.

The most prominent symptom of ulcer of the cervix is vaginal discharge, which is sometimes streaked with blood. When the cervix is exposed with

the speculum, the ulcer on its surface comes into view. The ulceration may be large or small, superficial or deep. It often bleeds when touched.

The conditions that may be confounded with ulcer of the cervix are erosion of cervix and laceration of cervix with eversion of mucosa. In **erosion** the lesion is very superficial and usually surrounds the external os, and the whole surface is still covered with epithelium. The cause is usually apparent and there is no raised clear-cut border or sunken base. In **laceration** of cervix with eversion of mucosa, the laceration is apparent, and by clearing all secretion from the reddened surface and examining it closely, it can be seen that it is mucous membrane and not granulation tissue.

A.   B.
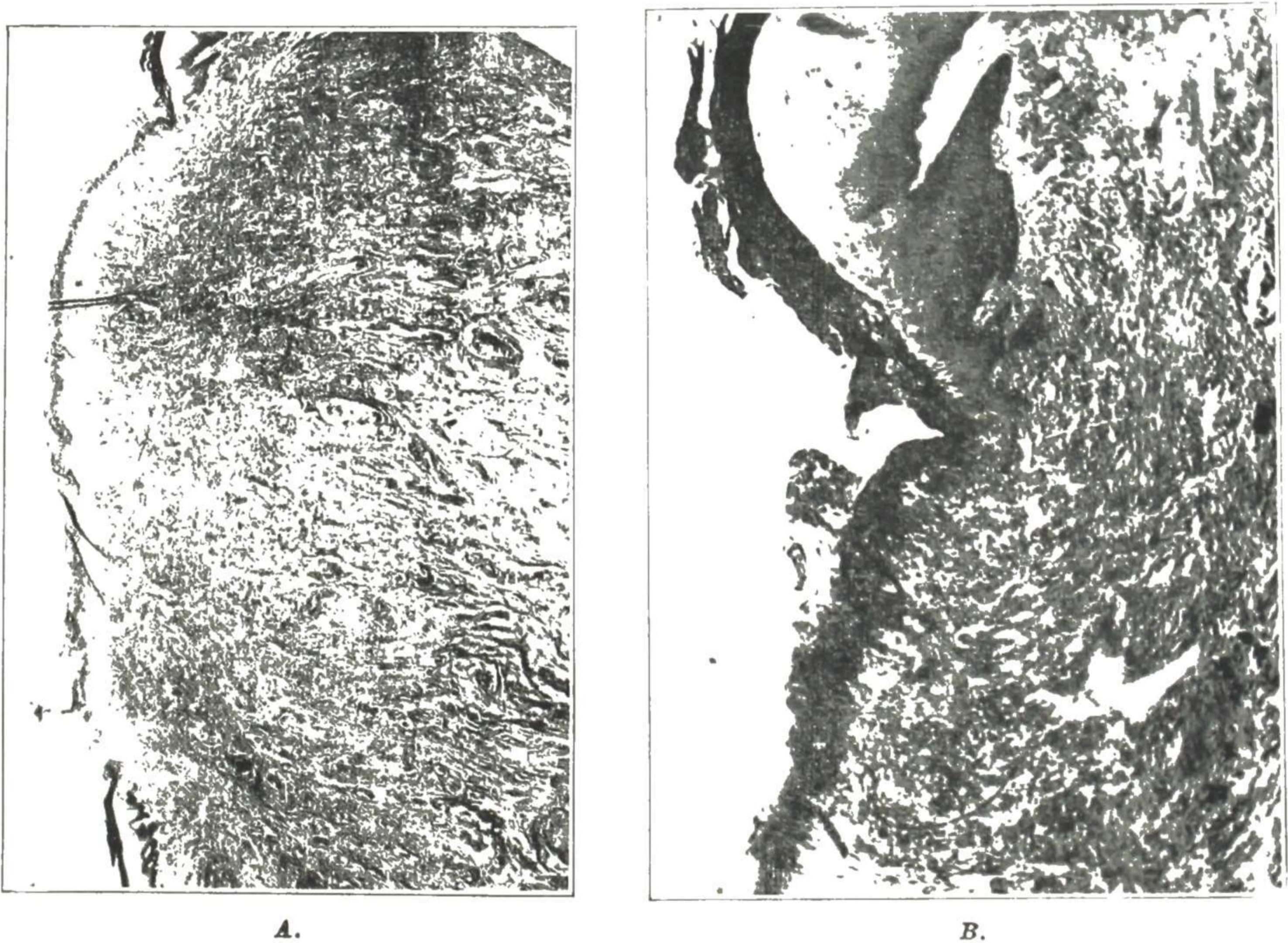
Fig. 660.—*A*, An ulcer of the cervix. Squamous epithelium is seen at upper and lower end but is absent over the surface of the ulcer between. *B*, Upper end of section shown in *A*, under higher magnification. The layer of squamous epithelium terminates abruptly at the edge of the ulcer. Gyn. Lab.

Simple Ulcer.—Simple ulcer of the cervix may be due to either of two etiological factors or a combination of both. One of these factors is local irritation, as from an irritating purulent discharge or the pressure of a pessary or rubbing of clothing on a prolapsed cervix, and the other factor is nutritional disturbance of the protective epithelium by endocrine or vitamin deficiency. These causes of ulceration have already been considered under simple ulcers of the vaginal wall, and the same irritations and local nutritional deficiencies are to be looked for about the cervix.

The important thing is not to make a diagnosis of simple ulcer until the other and more serious forms of ulceration have been definitely excluded. On the other hand, an ulceration appearing about the cervix after apparent cure

of cervix cancer should not be hastily pronounced cancer recurrence. A microscopic section may show it to be a simple ulcer, due to the combination of hormone deficiency and local radiation effect necessarily associated with curative treatment of cervix cancer.

Chancroidal Ulcer.—A rapidly spreading ulcer on the cervix with under-mined or punched-out edges, following suspicious intercourse, is probably chancroidal, and will usually have lesions on the vulva, as already described under Chancroid.

Syphilitic Ulcer.—If the ulcer is syphilitic there will be other evidences of syphilis and spirochetes may be recovered from its surface. The local find-ings in syphilis of the cervix depend on which stage of the disease is present.
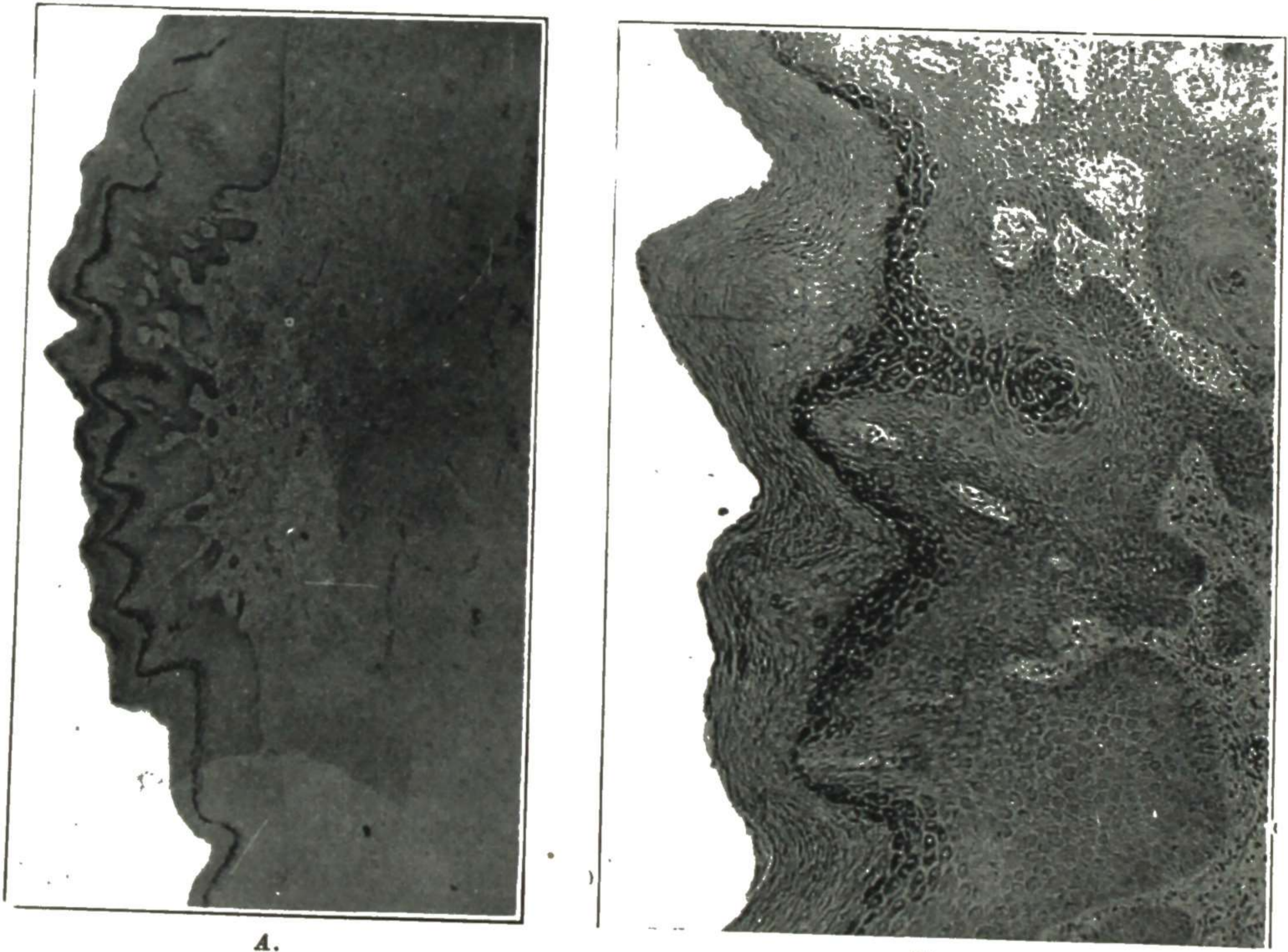
A.   B.

Fig. 661.—*A*, Syphilis of cervix, secondary. Section through a slightly elevated grayish white plaque a little less than 1 cm. in diameter. At the bottom of the picture the epithelium is practically normal. In the lesion, note the regular character of the epithelium and its line of demarcation, the marked development of the epidermis, and the marked stratum granulosum, which is scarcely apparent in normal cervical epithelium. *B*, High power of the upper central portion of *A*. Shows the squamous epithelium in which the cells have a definitely water-logged appearance. The epithelium is markedly hypertrophic and presents the characteristic underlying irregular surface. Note the large cells of the stratum granulosum and also the well-developed stratum corneum. Gyn. Lab.

It must be remembered that occasionally a primary chancre is located there. This probably occurs more frequently than is realized but is not seen because of the hidden location of the lesion. Gellhorn and Ehrenfest in their compre-hensive work state that it occurs in 1.5 per cent of all genital lesions, but according to Oppenheim the frequency is 8 per cent. The lesion is transitory and therefore is rarely seen. It appears as an indurated ulcer, runs a rapid course, and heals leaving little or no scar. The lymph glands draining this
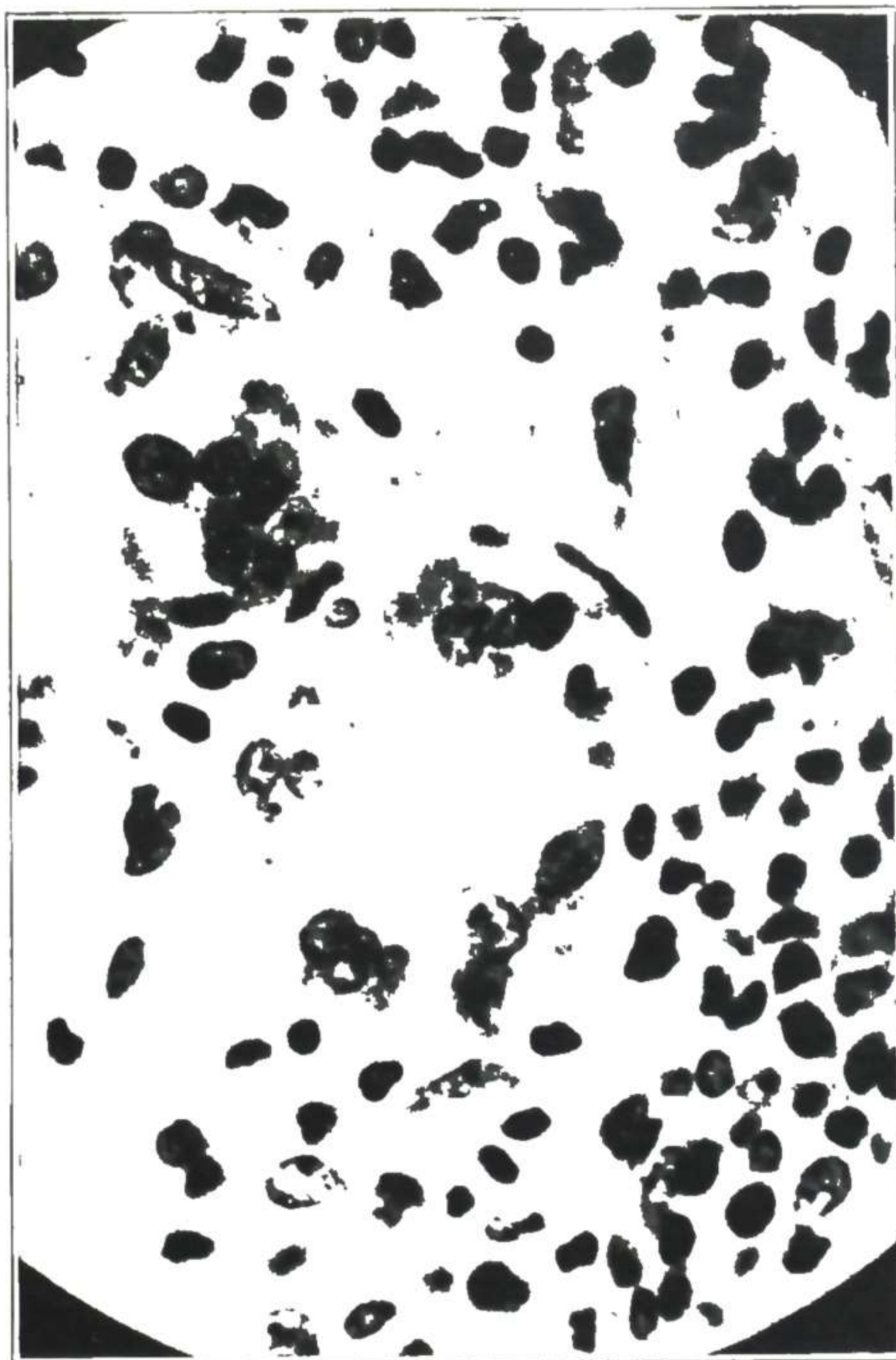
Fig. 662.—*A*, Syphilis of cervix, tertiary, showing numerous small gummas, each containing a giant cell. *B*, High power of one of the typical giant cells seen throughout this lesion. Gyn. Lab. (Schwarz—*Am. J. Obst.*)

Fig. 663.—Tuberculosis of the cervix uteri. Notice the cervical glands at the right and the exceptionally well-formed tubercle with giant cell at the left. There are several tubercles which show a tendency to coalesce. The patient was an eighteen-year-old nulliparous colored girl. Wassermann negative, and persistent antisyphilitic treatment had no effect on the lesion. The microscopic picture was typically tuberculous, with the characteristic caseation which distinguishes these tubercles from the gummas of syphilis. Gyn. Lab.

area are in the pelvis, so the inguinal glands are rarely enlarged. During pregnancy, the chancre is very persistent and because of it, accompanying induration may interfere with delivery.

In syphilis of the cervix the microscopic findings vary with the lesion present. In the primary stage, there is a marked round cell infiltration especially marked around the blood vessels. Plasma cells and giant cells are usually present. There is very little loss of the surface epithelium in this early stage. The second stage, condyloma latum, shows an exaggeration of the first stage plus a loss of the epithelium over the surface, with ulceration. In the third stage (gumma) there is edema and hypertrophy of the epithelium and necrosis. Figs. 661 and 662 show syphilis of the cervix.

Tuberculous Ulcer.—In tuberculosis of the cervix, scrapings from the surface should show tubercle bacilli and section of tissue the characteristic tubercles and giant cells, as shown in Fig. 663. Stevenson reported a series of cases, and gave the following summary:

1. Eighteen cases of tuberculous cervicitis are reported, one of which is the sole tuberculous focus of infection in the genital tract, and the only one active in the patient.

2. Tuberculous cervicitis is of chief interest because it clinically resembles carcinoma and it announces the presence of genital tuberculosis.

3. The cervix is involved in from 5 per cent to 8 per cent of the cases of genital tract tuberculosis and thus appears to have a relative immunity to infection. About 90 per cent of the cases of cervical tuberculosis are secondary to upper genital tract infection. A true primary cervical tuberculosis is extremely rare.

4. The two chief symptoms are a persistent offensive watery leucorrhoea and bleeding following coitus or douching.

5. Physically the cervix shows symmetrical hypertrophy and superficial friability, and the portio may show abnormalities ranging from erosion and eversion to ulceration or papillary granulations.

6. The treatment should be surgical when possible and as radical as necessary and as the condition of the patient will allow.

Counseller and Collins reported 109 cases—one of their own and 108 from the literature. Some years later, Collins reviewed the subject and brought the list of reported cases up to 191, and the following quotation as to treatment is from his article:

The treatment of tuberculosis of the uterine cervix should preferably be of a radical surgical character, such as abdominal panhysterectomy with the possible preservation of one ovary, if the patient's condition and other factors are favorable, because usually extensive tuberculous disease of the upper pelvic part of the generative tract is present and must be eradicated if cure is to result. For that reason and because of the rarity of a primary tuberculous infection of the cervix, local treatment of the cervical lesion is not advisable. For similar considerations roentgen and radium therapy will often prove to be disappointing in their end results.

The contraindications to the employment of surgery are advanced local tuberculous lesions with extensive involvement of the neighboring bladder or rectum, extensive tuberculous salpingitis, marked secondary infection, the presence of active tuberculous foci elsewhere, cardiovascular disease and senility. The ultimate prognosis in this disease entity is dependent on the type of treatment employed and on whether active tuberculosis is present elsewhere in the body.

Granuloma Inguinale.—This form of ulceration of the cervix has been reported by different writers. Pund, Huie and Gotcher found 9 cases of granu-

loma inguinale of the cervix in 67 negro patients with noncancerous disease of the cervix requiring specimen excision.

Fig. 664 is from an article by Arnell and Potekin, who gave the following summary:

1. Thirty-eight cases of granuloma inguinale of the cervix were observed at Charity Hospital of Louisiana during the ten-year period ending July 1, 1939, 21 of the number being identified within the last two years. Four of the patients were white, and represent the first instances of this disease to be reported in white women.

2. The clinical and histopathologic features of the lesion are discussed. The diagnosis is dependent upon the demonstration of the pathognomonic cell-containing Donovan bodies, which are most readily identified by the use of fixed biopsy material and the silver impregnation method of Dieterle.
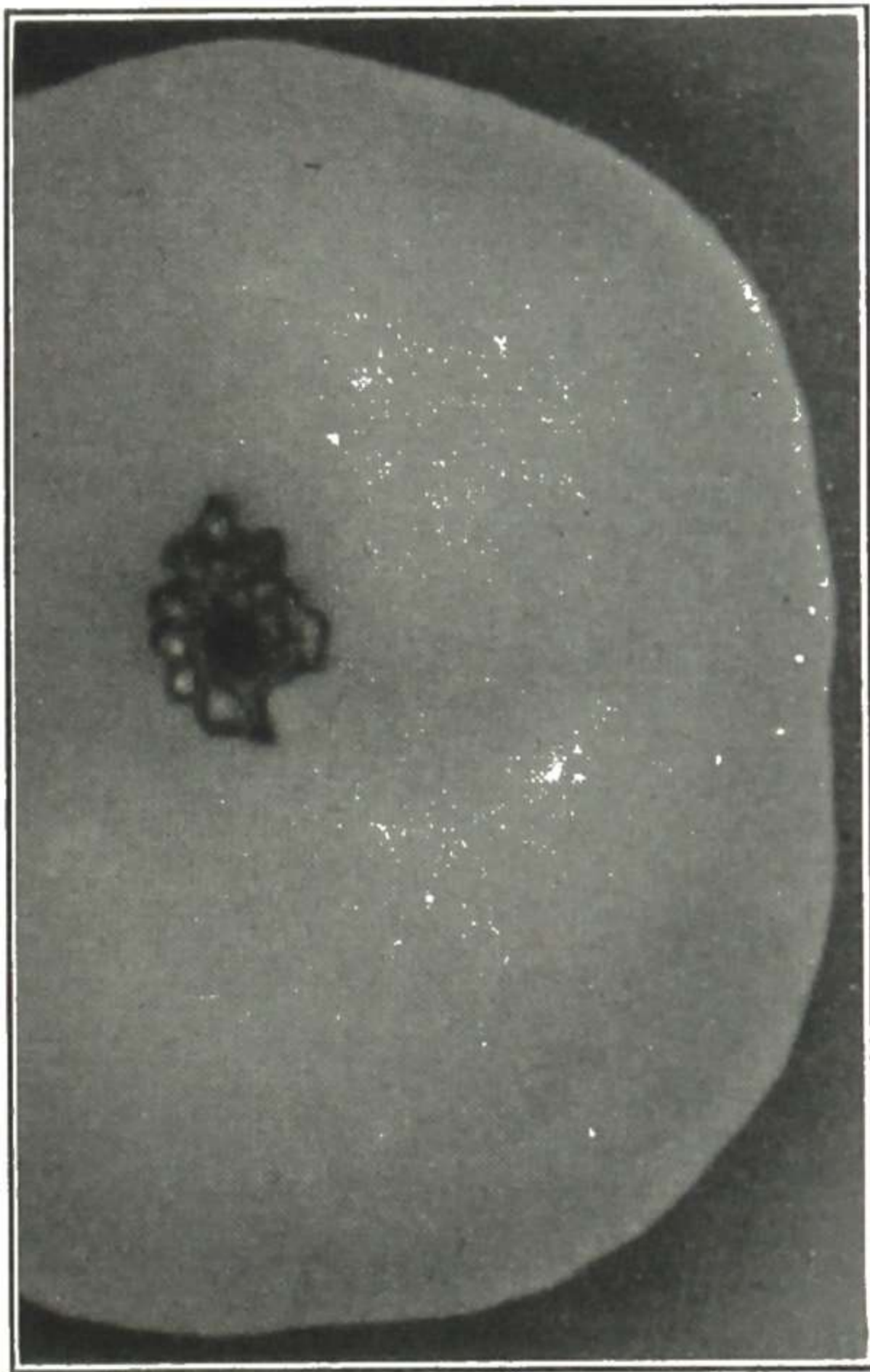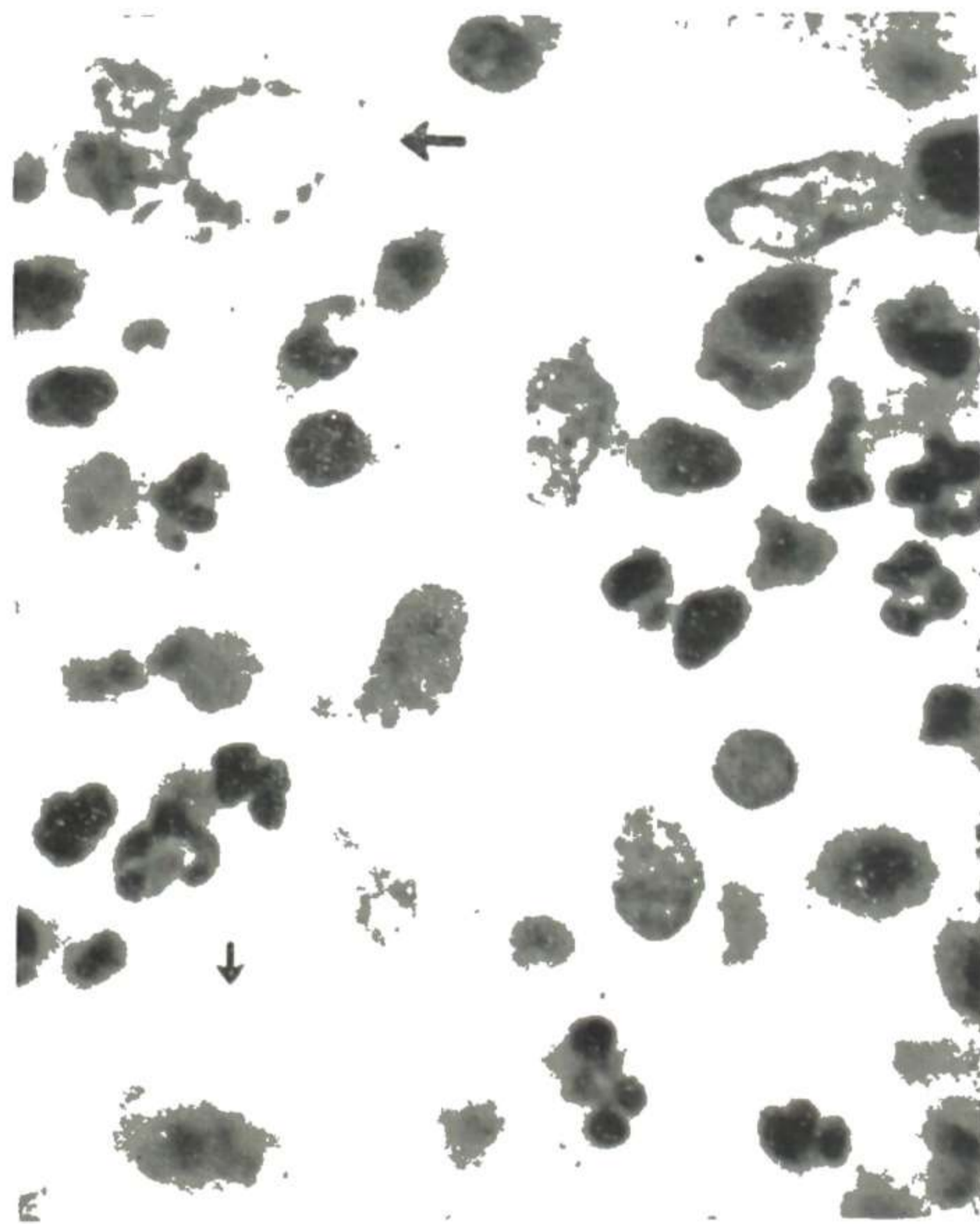
Fig. 664.   Fig. 665.

Fig. 664.—Early granuloma inguinale of the cervix. Note the close resemblance of the lesion to a cervical erosion. (Arnell and Potekin—*Am. J. Obst. & Gynec.*)

Fig. 665.—Section from lesion of cervix. Note characteristic cell of granuloma inguinale and arrangement of bodies within intracytoplasmic cysts, upper left. Two other cells, not in focus, indicated by arrows. Hematoxylieosin. Slightly reduced from photomicrograph (× 1,440). (Pund and Greenblatt—*J. A. M. A.*)

3. Carcinoma of the cervix is easily confused with cervical granuloma inguinale, and 27 of the 38 cases in this series were so diagnosed. The close clinical similarity of the two conditions is responsible for the error.

4. Vaginal bleeding and pelvic pain were the outstanding symptoms.

5. Intravenous antimony therapy is the most effective form of treatment, and tartar emetic gives the best results. The duration of treatment is shortened if large growths are completely excised by means of the cautery knife before specific therapy is begun. Recurrences are common.

6. Granuloma inguinale of the cervix is a clinical entity which demands general recognition and further study. Only by these means will the true incidence be established and improved methods of diagnosis and treatment be evolved.

Fig. 665, showing the microscopic features, is from an article by Pund and Greenblatt.

Lymphogranuloma Inguinale.—Ulceration of the cervix due to this cause would be accompanied with the more common lesions of this disease, which are described in Chapter IV.

Actinomycosis.—This vegetable fungus, known as the ray fungus and capable of causing extensive ulceration, has been found in the cervix. Jaffe reports a case and discusses actinomycosis of the uterus.

Cancerous Ulcer.—In any ulcer of the cervix, the determination as to whether or not it is a beginning cancer must be made promptly, excision of the area for microscopic examination being carried out if necessary.

Treatment of Ulcer of Cervix

The treatment of an ulcer of the cervix is indicated by the diagnosis as to the type of ulceration, which has been discussed above. The treatment of the various diseases causing noncancerous ulceration has been considered in Chapter IV under ulcerations of the vulva and vagina. Cancer of the cervix is considered in Chapter IX.
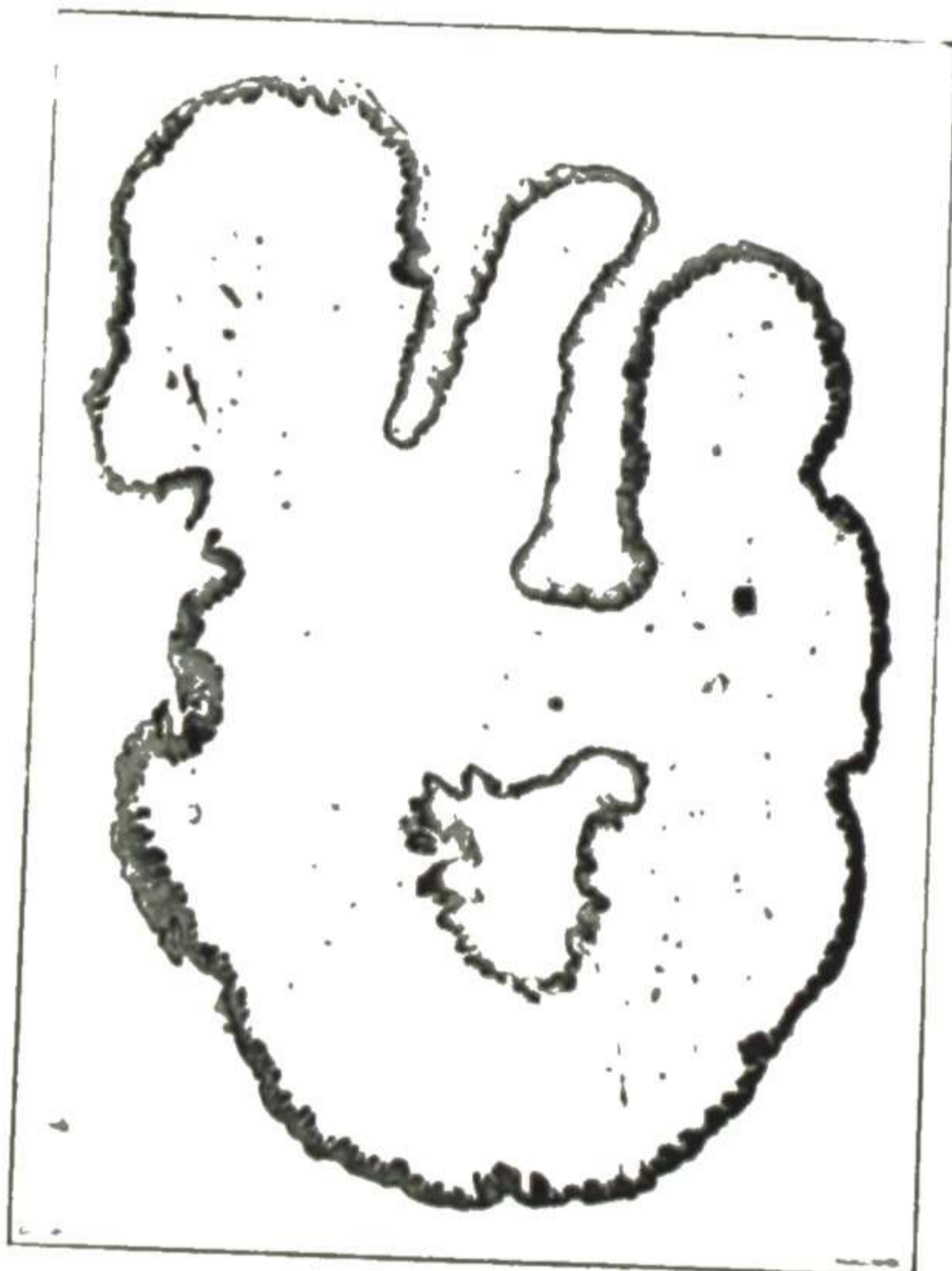
Fig. 667.

Fig. 668.

Fig. 667.—Cross-section of a cervical polyp. This is the solid type with no dilated glands showing.

Fig. 668.—High power of a cervical polyp of the glandular type. Gyn. Lab.

CERVICAL POLYPI

Cervical polypi is the term applied to small nonmalignant tumors found in the cervix uteri (Fig. 666). They are usually simple adenomas of the cervical mucosa and hence are frequently designated as "mucous polypi." Occasionally, a small myoma of the cervix or from higher will become pedicled and project from the cervix, constituting a polypus.

Ordinary cervical polypi are usually infected and frequently are of inflammatory origin. In the gross they resemble the cervical mucosa. **Microscopic**

Fig. 666.—Colored photograph of a fresh specimen, showing various points in gross pathology. A typical cervical polyp (mucus polyp) arises below the middle of the cervical canal and hangs to near the external os. It was not in sight on speculum examination of the patient in the office.

The opened uterus and cut surfaces give a good idea of the marked thickening of the walls, which enlarged the organ to the size of a fist. There is a diffuse myomatous process, with scattered small myoma nodules. Two of these show in the lower half—a sectioned one on the cut surface and a small submucous one projecting from the posterior wall. The operation was for disabling myomatous uterus with pressure symptoms. Gyn. Lab.

examination reveals a surface covering of cervical columnar epithelium. The polypi contain numerous cervical glands, many of which are cystic. The stroma shows a marked hyperemia, inflammatory infiltration, and edema. Round cells and plasma cells are numerous, and speak for the inflammatory nature of this condition. The microscopic features are shown in Figs. 667 and 668.

We had one case of mucous polyp in which the polyp was so long that it protruded outside the vagina for two inches. It would fill with mucus gradually, and intermittently it would empty through a small opening.
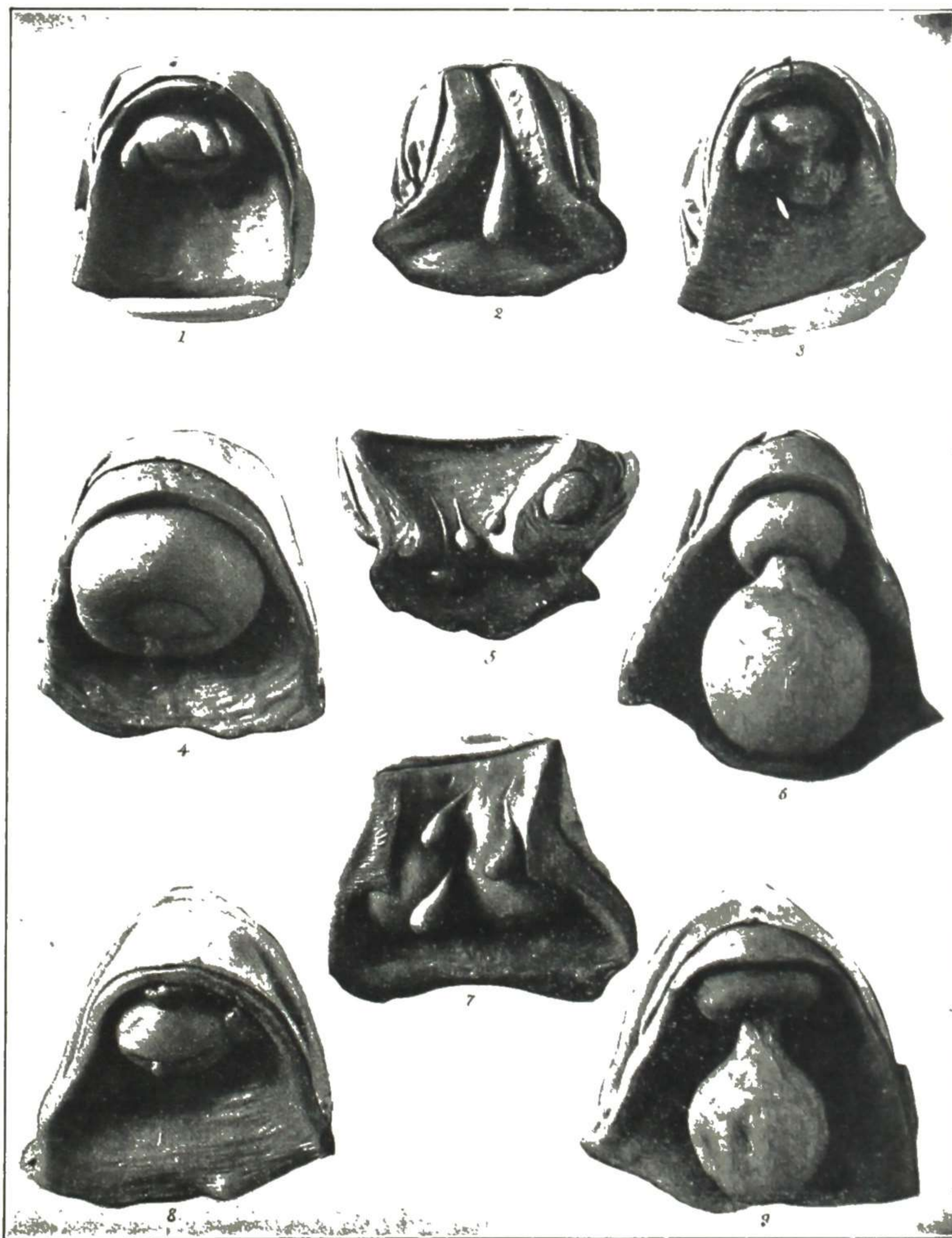
Fig. 669.—Showing different types of cervical polypi encountered in clinical work. (Hirst—*Diseases of Women*.)

Diagnosis and Treatment

The principal symptoms are bleeding and leucorrheal discharge. It is surprising what troublesome and persistent bleeding will sometimes be occasioned by a small polyp in the cervix.

On digital examination, the polyp may often be felt as a small soft mass projecting from the cervix or obstructing the external os (Fig. 669). In some

cases the polyp is so soft that it is not noticed on palpation, until the examining finger is moved slowly back and forth across the external os, when it will be felt to slip under the finger.

In the examination through the speculum, the polyp is seen (when low enough in the canal) as a small rounded red mass, projecting from the external os.

The important thing in the diagnosis is to distinguish beginning malignant disease from simple polyp. Not infrequently in malignant disease of the cervix, small projections form within the cervical canal and appear at the external os, presenting almost the same appearance as the simple polyp. Such a polyp is shown in Chapter IX, under Sarcoma of Uterus.

The treatment is removal and microscopic examination. The little mass of tissue may usually be grasped with the long dressing forceps and twisted off. An astringent-antiseptic application is then made, and a tampon or vaginal packing applied. If there is much bleeding, it is well to put a few drops of 1:1,000 adrenalin solution on the end of the tampon against the cervix. The tampon may be removed by the patient the next day.

All tissue removed from the cervix uteri should be sent for microscopic examination as already explained in Chapter II. If not a projection from malignant condition in the uterus, it is at least a product of chronic irritation and should be investigated.

HYPERTROPHY OF CERVIX

The term "hypertrophy" or "idiopathic hypertrophy" is applied to enlargement of the cervix independent of laceration and the resulting inflammation or of definite tumor formation. As this form of hypertrophy results principally in elongation, it is sometimes spoken of as "elongation of cervix." It is a rare affection.

Etiology, Symptoms, Diagnosis

The cause of this marked increase of tissue and elongation of the cervix is not definitely known. In some cases of prolapse of the uterus, the vaginal walls which prolapse at the same time drag on the cervix and elongate it, but not to the extent here contemplated. It may occur in the married or unmarried. It occurs oftenest in nulliparas, and this brings up the question of congenital or developmental defect.

There is an increase of tissue in the cervix but principally in a way that gives greatly increased length. If the hypertrophy takes place only in the infravaginal portion of the cervix (Fig. 670), the body of the uterus and the vaginal walls remain in approximately normal position, the long cervix projecting along the vagina or even outside of the vagina. Fig. 671 shows such a condition. If the hypertrophy is confined to the supravaginal portion, the vaginal walls, both anterior and posterior, are pushed downward by it, as in prolapse. The body of the uterus, however, remains in about the normal position. If the hypertrophy is confined to the intermediate portion, the anterior wall and the base of the bladder will be pushed down as in prolapse, the

posterior wall remaining stationary. Retroversion of the uterus and more or less prolapse are usually present also, and are caused by the dragging of the heavy cervix and the vaginal walls.

Examination reveals a mass with the characteristics previously mentioned. From prolapsus uteri it is distinguished by the body of the uterus being in approximately normal position. From uterine tumor, projecting into the vagina, it is distinguished by its form and by its central cavity. From inversion of the uterus, it is distinguished by the body of the uterus being in about the normal position, and by its central opening.

Treatment

The treatment of extensive elongation of the cervix, causing troublesome disturbance, is either amputation of the cervix or hysterectomy, the choice depending on the complications present.
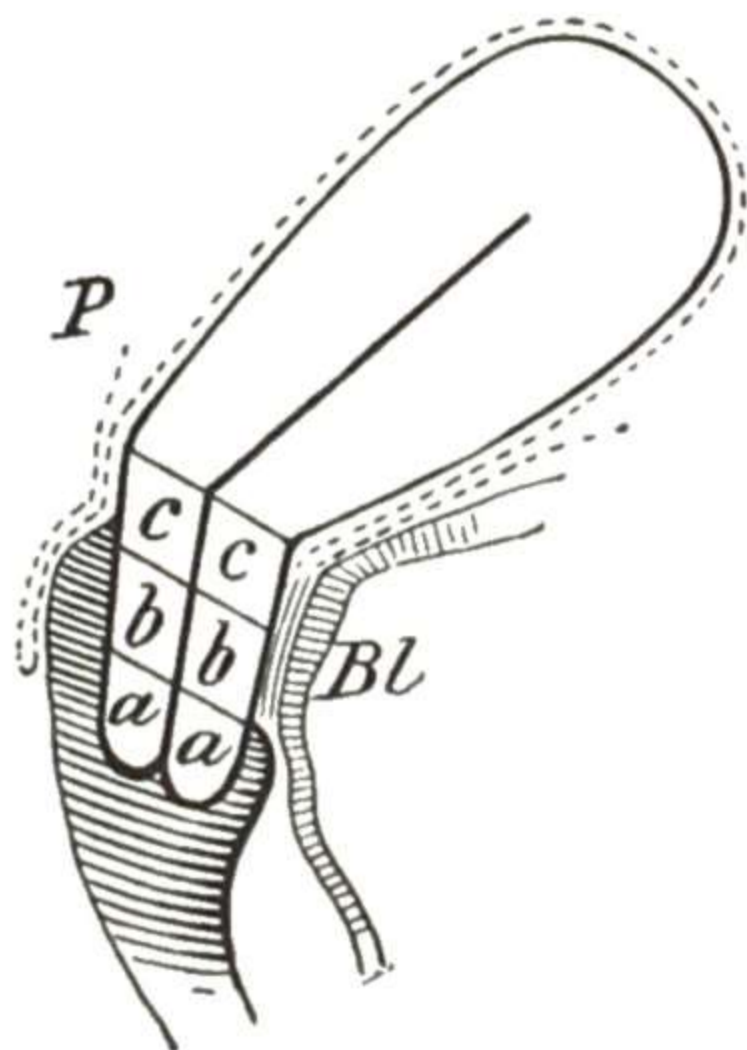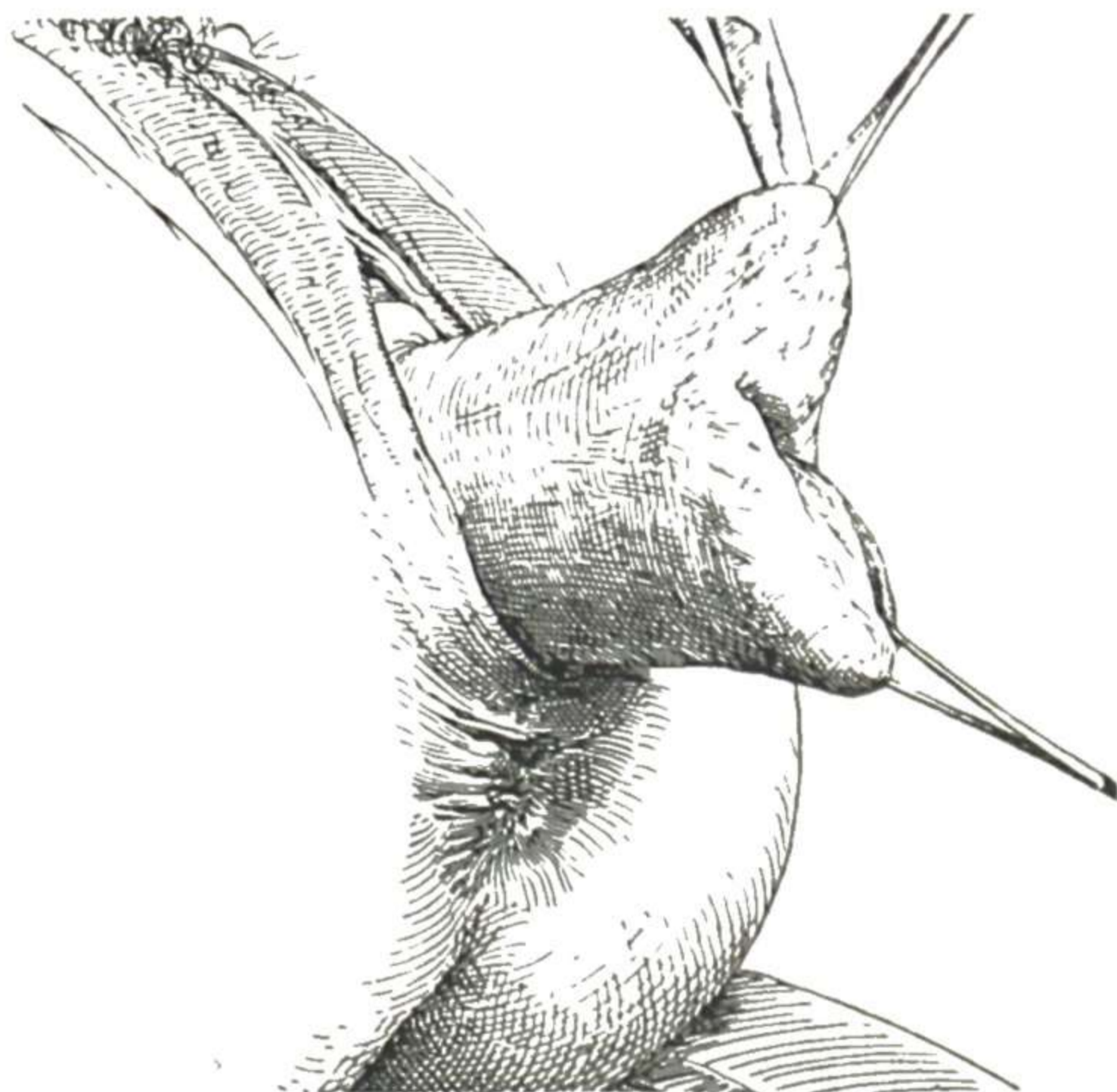
Fig. 670.   Fig. 671.

Fig. 670.—The three divisions of the cervix; a, infravaginal portion; b, intermediate portion; c, supravaginal portion. (Byford—*Manual of Gynecology*.)

Fig. 671.—Hypertrophy of the infravaginal portion of the cervix. (Kelly—*Operative Gynecology*.)

HYPERPLASIA OF ENDOMETRIUM

Hyperplasia of the endometrium is a persistence and exaggeration of the growth phase of the monthly cyclic change. It is not an endometritis, though inflammation may be present as a complicating condition. In its various forms it has received various designations, being confused principally with endometritis. The former confusion regarding the pathology of the endometrium was due chiefly to the lack of knowledge concerning the details of the cyclic changes associated with menstruation.

Olshausen in 1846 first described the condition and called it "endometritis fungosa." In 1853, Brennecke again described the condition and noted that there was an absence of corpora lutea in the ovaries. He suggested that the ovarian disorder was the cause of the endometrial changes. For a time it was thought to be caused by inflammation, but Cullen in 1900 recognized it as a

benign condition distinct from endometritis. The fundamental work of Hitsch-mann and Adler on the changes in the histologic picture of the endometrium during a normal cycle, and the later work of Schroeder, laid the foundation for the understanding of this interesting endometrial lesion. Schroeder's work in Germany and the contributions of Cullen, Novak, Fluhmann, Burch and many others in this country, have done much to make our knowledge of this condition more complete.

Etiology

Endometrial hyperplasia is due to a disturbance of the normal changes that take place in the endometrium, which in turn are dependent on the ovarian-pituitary hormonal influences associated with ovulation and corpus luteum for-mation. The particular hormonal influences which seem most responsible are excess formation of estrin (endometrium growth hormone) and deficient for-mation of progestin (corpus luteum hormone). The particular ovarian lesion most likely to be associated with endometrial hyperplasia is the "cystic" ovary resulting from nonrupture of follicles. In the nonruptured follicle the ovum dies, but the zona granulosa continues to function, resulting in excess estrin and abnormal growth of the endometrium.

In most cases of hyperplasia in which the ovaries have been examined, there is an absence of a recent corpus luteum corresponding to the menstrual period. This fact led to the conclusion that the failure of ovulation in some way was responsible for the hyperplasia. Novak stressed the importance of persistent and excessive stimulation by estrin as a cause of the condition. Failure of follicle rupture caused a persistence of the follicle containing estrin and an absence of corpora lutea. Proof of these contentions has been produced by Burch, Williams, and Cunningham experimentally in rodents. They were able to produce hyperplasia by the injection of estrin, and also by using the fluid obtained from cystic ovarian follicles. Kaufmann, as has been mentioned under Physiology, produced hyperplasia in the human castrate by large amounts of the estrogenic hormone. Werner in this country has also succeeded in pro-ducing it. Burch studied specimens of endometrium from cases of hyperplasia of the endometrium in human beings at various times in the cycle. In one case a previous instrumentation evidently caused ovulation, so that when another specimen was removed in the premenstrual period the endometrium showed typical premenstrual changes, whereas with the previous periods it had shown a hyperplastic endometrium.

Concerning the primary cause of the failure of follicle rupture, that has been discussed under the physiology of the pituitary-ovarian cycle (Chapter I).

The cause of the bleeding in hyperplasia has been the subject of much discussion. There is a distinct difference between menstrual bleeding and the bleeding in these cases. In normal menstruation, the withdrawal of the estrin causes a cessation of growth and vitality of the entire endometrium, causing a necrosis and desquamation down to the basal layer, and the resulting bleeding stops in a few days. With the hyperplastic endometrium the necrosis occurs in small, widely separated areas and gradually extends so that two or three months may elapse before desquamation is complete, or it may never be com-plete. It seems that the failure of the endometrium to desquamate properly

may be the important factor in the prolonged bleeding, for when curettage is done and the endometrium removed down to the basal layer, the bleeding usually stops.

Pathology

In hyperplasia the endometrium is markedly thickened (Figs. 672, 673) and the glands are numerous and vary greatly in size and shape, some being much dilated. The mucosa may be so redundant as to form folds or even polypi. In curetting one usually obtains a large amount of endometrial tissue. When a large piece is seen, it is ordinarily a strip of fairly uniform thickness, instead of the chunky broken pieces obtained in endometrial carcinoma. Occasionally, however, there are polypi or other irregular thickenings which give the curettings the gross appearance of malignancy.

Fig. 672.
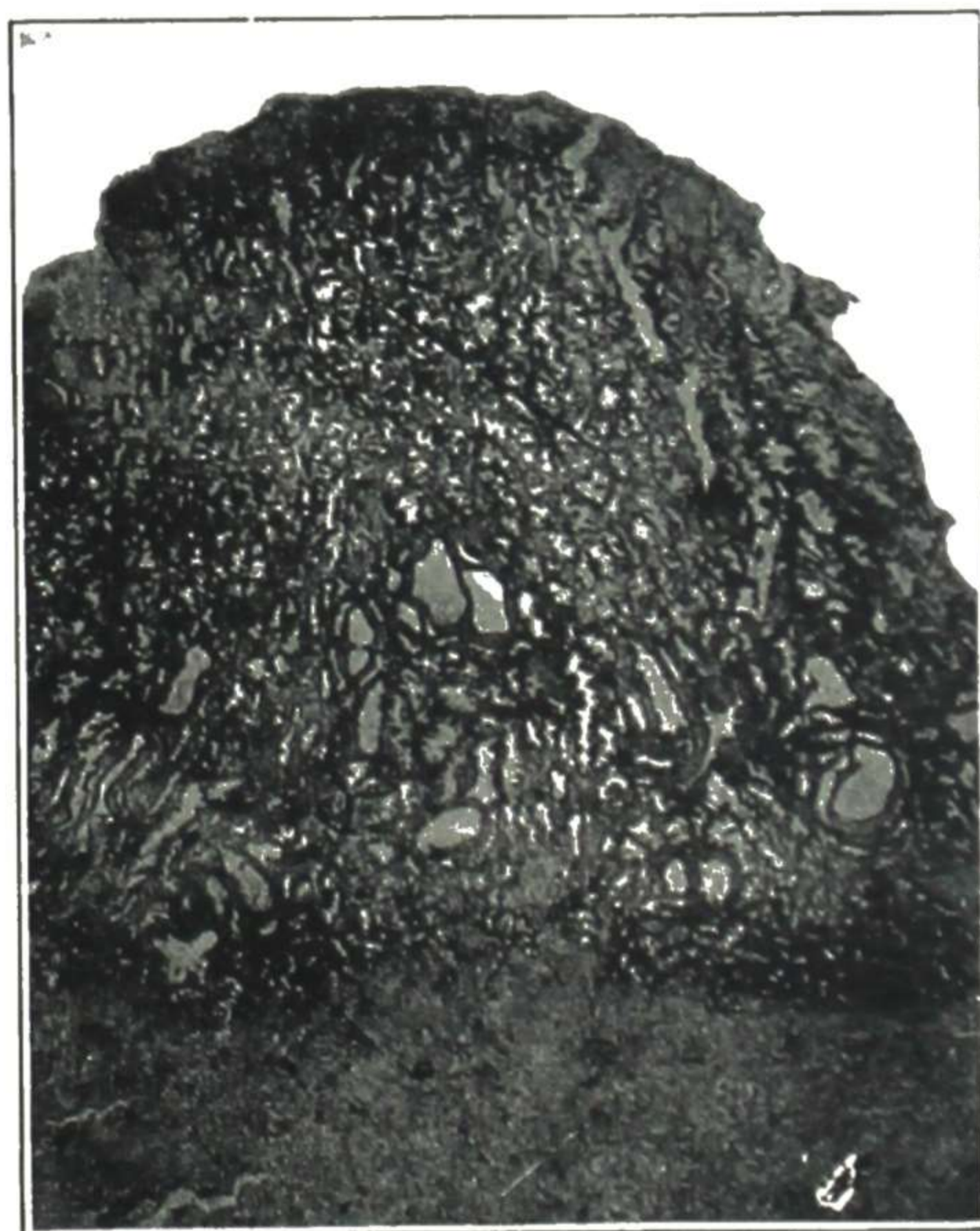
Fig. 673.

Fig. 672.—Hyperplasia of endometrium. Gross specimen showing greatly thickened endometrium, which is distributed in velvety folds. Gyn. Lab.

Fig. 673.—Low power picture of the endometrium in Fig. 672. Notice the thick endometrium, the greatly dilated glands, and the compact superficial layer. Gyn. Lab.

In hyperplasia there is evidence of varying degrees of excessive growth. In the mild form there is merely an increase in the number of glands and cells. The glands present no consistency in form. Some are in the early growth stage, others may be of the "saw toothed" stage, and some are cystic. The epithelium lining the glands varies from a flattened single layered epithelium to one which is pseudostratified, containing ciliated cells. Mitotic figures are very commonly seen. They are usually areas of edema, hemorrhage, and necrosis. The stroma may or may not show hyperplasia.

In the more severe cases there is a greater variation in the size of the glands, producing the well-known "Swiss cheese" appearance described by Novak. Glands are present representing all stages of the menstrual cycle, instead of all the glands being in about the same stage. The free border of

Fig. 674.—Hyperplasia of the endometrium of the "Swiss cheese" type described by Novak. Note the large cystic glands scattered throughout the endometrium. Gyn. Lab.

Fig. 675.—Hyperplasia of the endometrium. High power of Fig. 674 taken from an area a little to the right and above the center of the picture. Shows the character of the cells lining the endometrial glands and the surrounding stroma. Gyn. Lab.
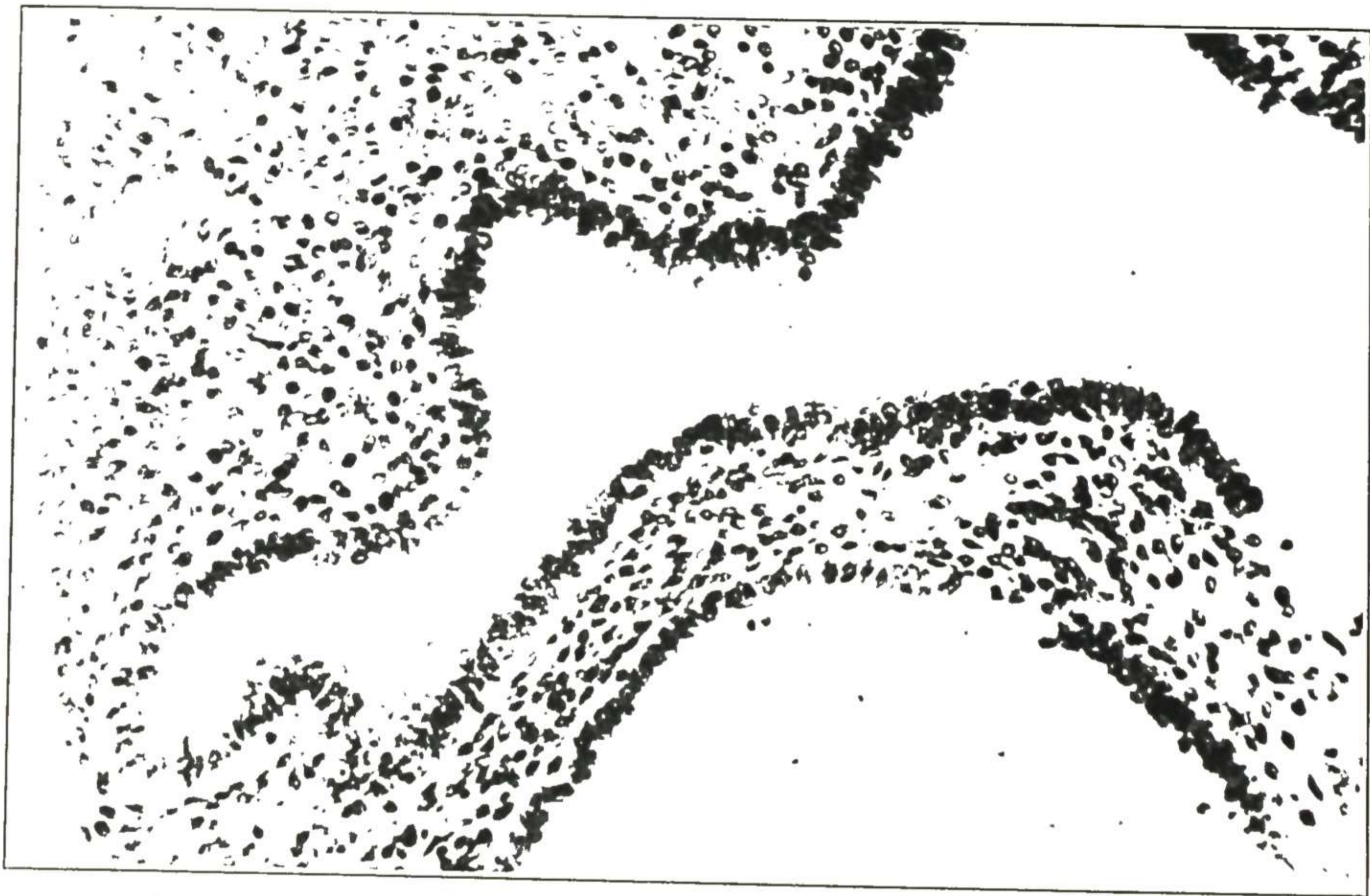
the epithelial cells lining the glands is usually clear cut, and there is little evidence of secretion. The epithelium may be single or many layered. The necrotic areas are very noticeable in the advanced cases. This point has been stressed by Schroeder. Figs. 674 to 677 show the microscopic characteristics of different types of endometrial hyperplasia.

Polypi of Endometrium.—When endometrial polypi are present, there is usually associated general hyperplasia; in fact, the polypi apparently represent local exaggerations of the hyperplasia. The gross appearance and the microscopic characteristics of endometrial polypi are shown in Figs. 678 and 679. A polyp may act as a foreign body in the uterus, causing uterine contractions. If the pedicle becomes sufficiently elongated, the polyp is extruded through the external os, and can be seen on speculum examination. In such a case the pedicle may slough and the polyp be expelled spontaneously.
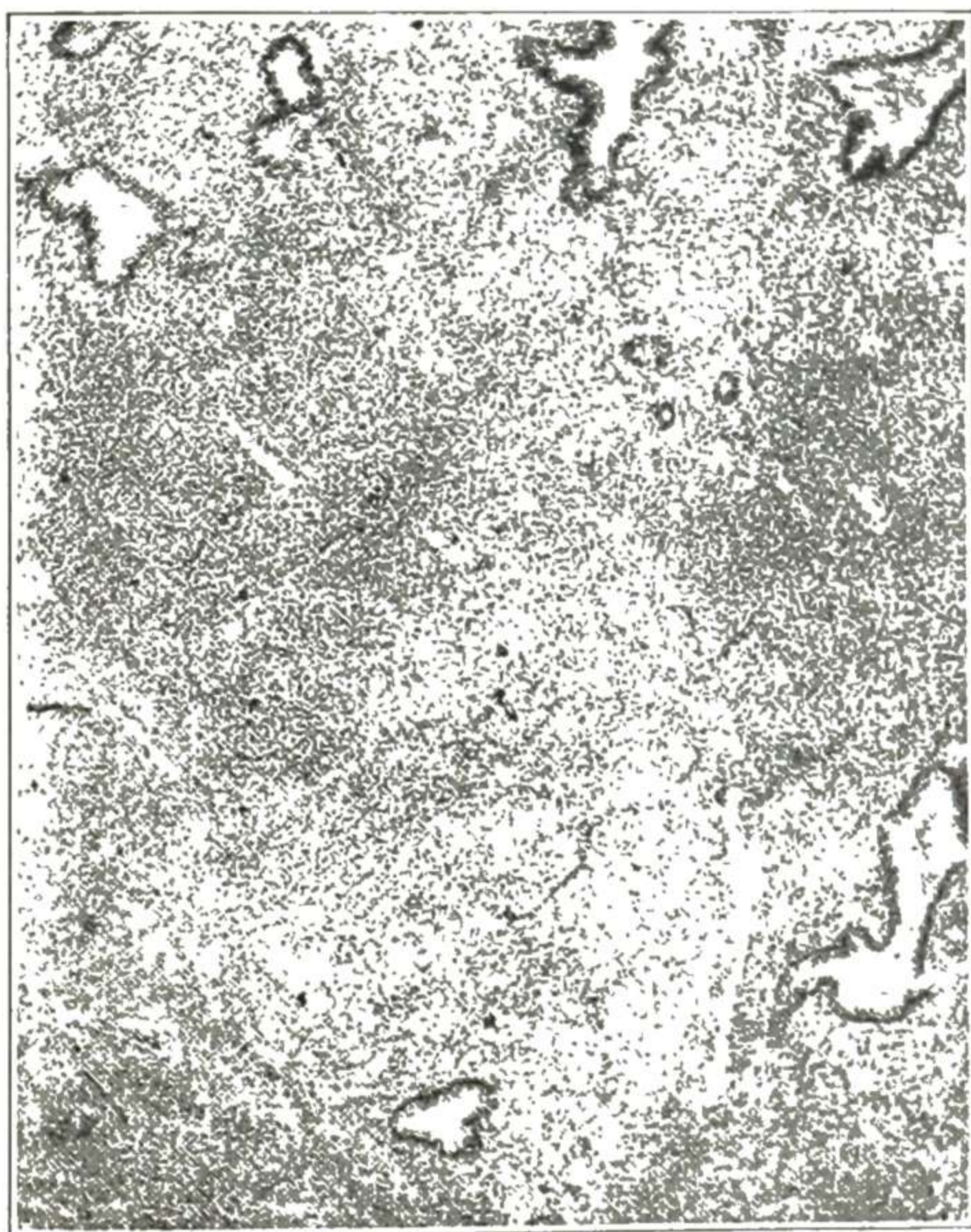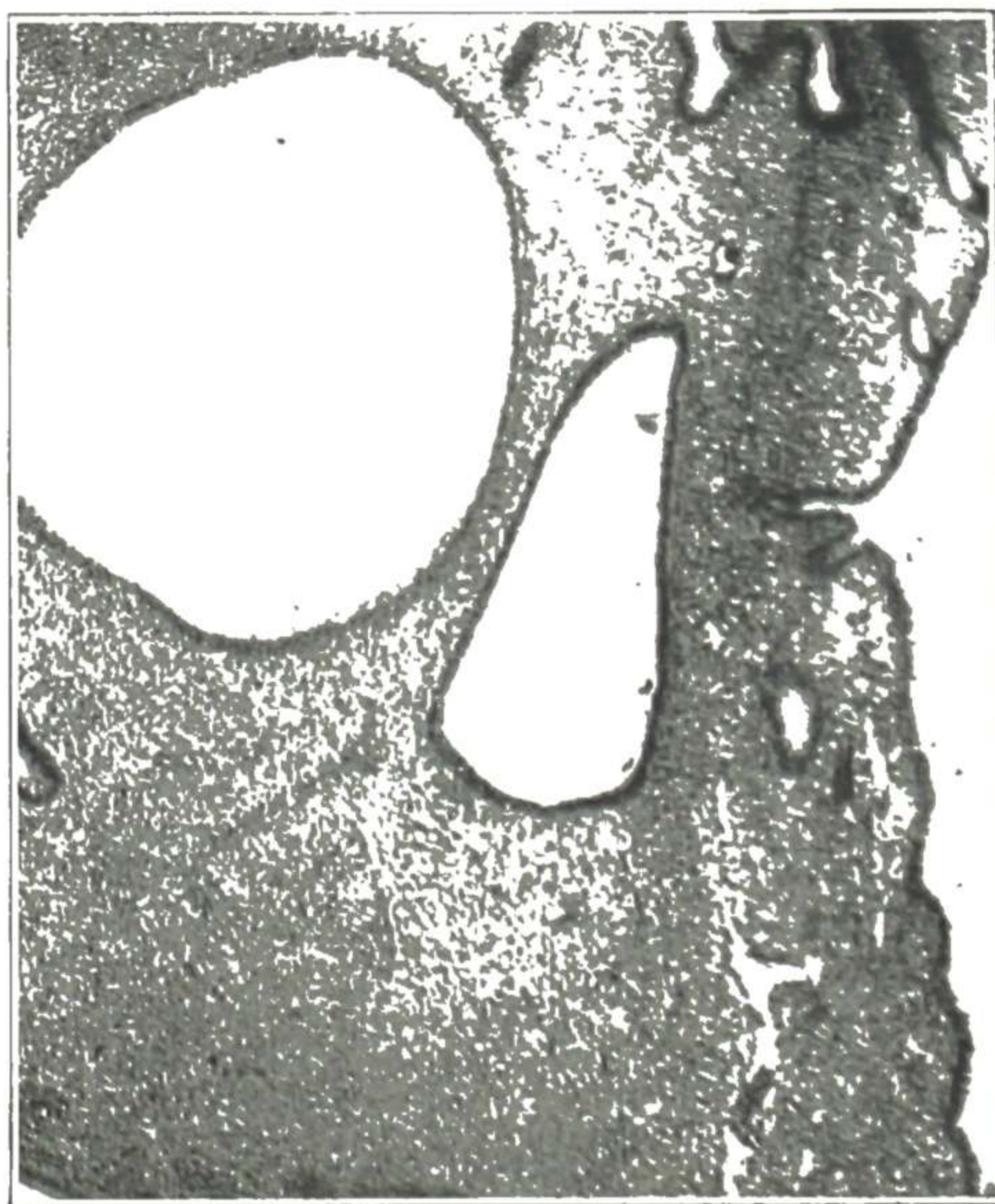
Fig. 676.   Fig. 677.

Figs. 676 and 677.—Curretting. Fig. 676, Hyperplasia of endometrium with increase in stroma. Fig. 677, Hyperplasia of endometrium, with cystic dilatation of glands. Gyn. Lab.

Occasionally a sarcoma or carcinoma of the endometrium will form a polyp which projects from the cervix and may be removed as a supposedly simple cervical polyp, hence the importance of microscopic examination of all tissue removed from the uterus, even apparently simple cervical polypi.

Symptoms and Diagnosis

Bleeding is the most common clinical disturbance from endometrial hyperplasia. In the typical cases associated with nonovulation, the bleeding loses the cyclic character dependent on ovulation and may persist for weeks at a time. Also there may be periods of amenorrhea between the spells of bleeding —that is, the absence of ovulation removes the cyclic influence which normally starts the flow as well as the influence which normally stops it.

This type of bleeding occurs principally in young persons in whom the normal endocrine cycle is not fully established or in the menopause period as the cycle is ceasing. In the active childbearing period with full establishment of ovarian-pituitary physiology, bleeding is more likely to be due to some local lesion, such as inflammation, or tumor, or local circulatory disturbance, though the local metabolic disturbances from these conditions may perhaps cause some hyperplasia.

The exact diagnosis of endometrial hyperplasia is dependent on microscopic examination of curettings, though the condition may be inferred in persistent bleeding in the young, as menstruation is being established, and in later life as it is ceasing. The clinical differentiation of this type from other types of uterine bleeding, by symptoms and observation and medication, is taken up in detail under Menorrhagia and Metrorrhagia in Chapter XIV.

Fig. 678.

Fig. 679.

Fig. 678.—Hyperplasia of the endometrium, which has extended to polyp formation. Photograph of gross specimen. Gyn. Lab.

Fig. 679.—Photomicrograph of the specimen shown in Fig. 678. Notice that the polyp is strictly endometrial. Gyn. Lab.

Treatment

The plan of medicinal and endocrine treatment for uterine bleeding, along with differential diagnosis as treatment proceeds, is given later under functional bleeding, as just stated. If the bleeding persists in spite of other measures, then curettage is indicated.

Curettage

FOR ENDOMETRIAL HYPERPLASIA, CHRONIC ENDOMETRITIS, UTERINE BLEEDING, AND INTRAUTERINE DIAGNOSIS

Attention must be called to the dangers of curettage, which is not the simple and harmless procedure many suppose. The uterine wall is easily perforated by the curette, or sound, or forceps, which perforation may cause fatal peritonitis. Curettage may cause serious aggravation of conditions in cases of pelvic inflammation or of tubal pregnancy. In other words, uterine curettage carries the dangers incident to a surgical procedure within a vulnerable organ situated in the peritoneal cavity, and it must be used with due skill and for proper indications only. Indiscriminate curetting of the uterus has done much harm through lack of skill in technique and lack of judgment in the choice of cases.
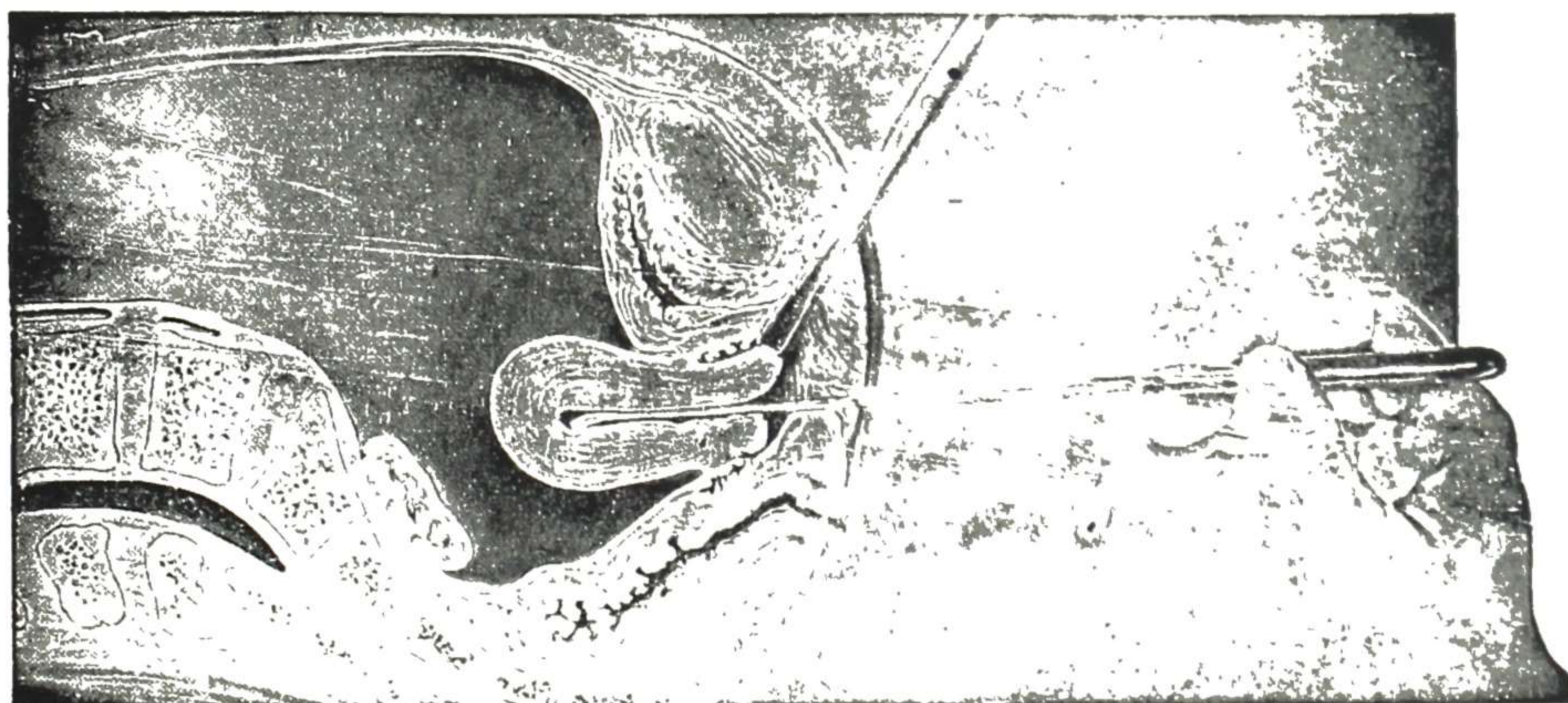
Fig. 680.—Method of holding the curette. It should be held like a pen, so that every graduation of force may be appreciated and regulated. The cutting edge of the curette is to be turned in every direction and the shank bent sufficiently to curette systematically all parts of the cavity.

After the patient has been prepared on the operating table and draped, it is well to make bimanual palpation and record the findings, as this deep palpation under anesthesia or analgesia may help to clear up some doubtful point as to conditions in the pelvis.

After the cervix is exposed by introduction of the retractors and grasped with tenaculum forceps, the cervical canal is cleansed with an antiseptic solution. The canal is then dilated with dressing forceps sufficiently to admit the large bladed dilator, or with graduated dilators as preferred. When the cervix is sufficiently dilated, the endometrial cavity is swabbed with an antiseptic solution on cotton held in the uterine forceps. At the same time the depth of the uterine cavity is determined with the cotton-tipped forceps, the distance from the external os, marked with the finger, to the end of the withdrawn forceps being measured with the graduated sound. This is much safer than using the sound in the uterus, for the tip of the sound may perforate the uterine wall on very slight pressure, which serious accident has happened many times.

The dilatation of the cervix should be carried out slowly and carefully, the direction of the dilatation being changed several times, to secure gradual dilatation in all directions and prevent rupture of the cervix. The cervix should, in this manner, be dilated sufficiently to admit the medium-sized curette easily.

In certain cases in which the cervix is abnormal, it may suddenly tear at some point and the blade of the dilator will pass through the wall of the cervix into the periuterine connective tissue. To prevent this accident it is well to keep the set-screw, at the handle between the blades, set so that there can be no sudden wide separation of the dilating blades.

When sufficient dilatation of the cervix has been secured, inject into the vagina some of the citrate solution (2 per cent solution of sodium citrate, to prevent clotting on the tissue-specimens, which is troublesome in the laboratory work) so that it will be carried into the cavity with the curette. The medium-sized curette is then introduced and the soft endometrium scraped away. The curette should be held tightly between the thumb and the fingers, in the same manner as a pen (Fig. 680). A mark on the handle indicates in which direction the cutting edge lies. The interior of the uterus should be gone over systematically, so that no part of the surface is missed. The pressure must be applied carefully. It must be firm enough to remove the softened diseased tissue, but not firm enough to remove any of the firm tissue beneath it. The fact that comparatively healthy firm tissue has been reached is indicated by the grating sensation imparted to the curette. As a rule, this is easily recognized and after some practice the uterus may be cleared out rapidly and safely. In exceptional cases, however, the wall of the uterus is diseased to a considerable extent and softened, and great care is necessary to avoid perforation of the wall.

Fig. 681.

Fig. 682.

Fig. 681.—Returning the uterus to its normal position after curettage, and making the bimanual examination under anesthesia. The examination under anesthesia may be made immediately before the curettage if preferred.

Fig. 682.—Putting in the vaginal packing.

After the surface of the cavity has been gone over carefully with the sharp curette, the débris is brought into the vagina with the curette, and then worked out of the vagina into the specimen basin by forcible injection of citrate solution with the tip of the syringe in the vaginal vault back of the cervix. The uterine cavity is then swabbed with dry cotton or gauze to gather up any loose fragments remaining.

When the cavity is believed to be clean, it is well to introduce the uterine forceps, open widely in the cavity, rotate some, close, and remove. In this way may be caught an attached shred or a loose roll that is not brought out by the swabbing. This little maneuver has saved the embarrassment of leaving in remnants on several occasions—one time the principal part of an incomplete miscarriage.

When the endometrial cavity is clear of remnants, it is well to make an astringent and antiseptic application, to check bleeding, kill bacteria carried

in from the cervix or cancer cells that may be in the cavity, and to seal lymph and blood spaces to prevent metastasis. For this purpose an application of carbolic acid (95 per cent) followed immediately by an application of alcohol has proved satisfactory. If there is persistent undue bleeding, the uterine cavity may be packed with gauze: otherwise packing is not needed.

When the operation is finished, cleanse the vagina, remove the speculum, introduce two fingers to the cervix and bring the fundus uteri well forward by bimanual manipulation (Fig. 681). In the curettage, the uterus is drawn downward somewhat and the fundus sometimes goes backward. Unless the uterus is brought forward into normal position at the close of the operation, it may remain in retrodisplacement and cause trouble. If intrauterine packing is used, the vaginal portion may be held in the palm of the hand (Fig. 682) during the replacement of the uterus.

After curettage the epithelial covering of the uterine interior is quickly regenerated from the epithelium of the remnants of glands remaining, and gradually the whole endometrium is restored.

After-care.—The vaginal and uterine packing is removed in about twenty-four to forty-eight hours, and an antiseptic vaginal douche is given once daily. The vulvar dressing is continued for a week. The patient may ordinarily get up in from two to four days after curettage, except when there is some associated disease that would be benefited by longer rest in bed.

Curettage is only one step in the treatment. After that endocrine investigation and treatment and other measures required for the condition should be carried out. Associated pathologic conditions, such as malposition of uterus, laceration of cervix, laceration of pelvic floor and pelvic inflammation, must also be corrected as far as possible, for if allowed to continue, the uterine congestion resulting therefrom will tend to delay recovery and may result in the re-formation of a thickened bleeding endometrium.

Wilson and Elden reported treating five women presenting the problem of uterine bleeding associated with hyperplasia, using progesterone in comparatively small doses. An interesting case of ours illustrated the recession of a very marked hyperplasia of the endometrium after the use of pregnant mare's serum. The patient had five curettements over a period of three years for recurrent bleeding and each time the endometrium showed a more marked hyperplasia. With the final curettage the condition was so marked that some of the pathologists thought that it was adenocarcinoma; there was sufficient difference of opinion, however, to justify observation. After this curettage there was no flow for four months; a series of four doses of 200 U of anteron was then given and this was followed by a period seven days after the last dose. The period lasted seven days and was normal except for severe pain. Following this we had planned to secure an endometrial specimen at the onset of the succeeding period, but there was amenorrhea for two months. Pregnancy could be excluded, and the securing of an endometrial specimen was attempted but had to be abandoned on account of the severe pain on trying to insert the small curette. Because of the marked proliferation seen on the previous curettage we felt that it was important to determine the condition of the endometrium before further treatment and hence performed another curettement. This time the report was normal interval endometrium, no evidence of

corpus luteum effect. After four months of amenorrhea the flow was initiated four days after completion of a series of six doses of proluton (10 mg.) or 60 mg. in all.

A very interesting question in this connection is whether or not endometrial hyperplasia in the late menopause period is an indication of a tendency to endometrial carcinoma. This is an important problem, and one concerning which additional dependable information is needed. R. J. Crossen and J. E. Hobbs made an analysis of our cases of endometrial carcinoma, and are investigating the subject in various directions. A preliminary report was made (J. Missouri M. A.), and the investigative work is being continued. Sufficient facts have already been accumulated to indicate that endometrial hyperplasia in late menopause (fifty) may be taken as a sign of a definite tendency to endometrial carcinoma. So strong is this indication that in a patient menstruating at that age we advise stopping the undue endometrial activity by radium treatment, which is accompanied, of course, by curettage and microscopic investigation to determine whether or not carcinoma has already started.

MEMBRANOUS DYSMENORRHEA

Membranous dysmenorrhea is the term applied to that form of painful menstruation accompanied by the expulsion of membrane from the uterus. The membrane is usually passed in small pieces, though occasionally it is thrown off as a complete cast of the interior of the uterus. It consists of the superficial layers of the uterine mucosa (endometrium), and is thrown off en masse as the result of nutritive changes which are not yet fully understood.

The pains come with the flow and are paroxysmal—of the same character as the pains of mechanical dysmenorrhea, but very severe, resembling labor pains. After these have continued for several hours or a day or two, pieces of the membrane are expelled. There is then relief unless other pieces pass. The membrane, mixed with the menstrual flow, is the diagnostic sign of this form of dysmenorrhea. Care must be exercised not to confound it with miscarriage. It usually recurs every month or so and may last for years.

The condition may appear at puberty or at any time during menstrual life. It is more common in sterile women, the same functional disturbance causing the membranous dysmenorrhea may be a factor in the sterility.

Etiology and Pathology

Hitschmann and Adler proved that it was not of inflammatory origin and Aschheim confirmed this, finding that the endometrium was bacteriologically sterile. Halban feels that there is an endocrinologic factor which causes premature uterine contractions with separation of the endometrium en masse at the level of the functional layer.

Gross.—These specimens are usually brought in by the patient in a piece of paper or cloth all dried out. Patients who complain of passing tissue with each period should be instructed to place the tissue in a bottle of 10 per cent formalin immediately after it is passed.

The membrane as a whole does not stain as clearly as it does in uteri removed at operation or in curettage specimens. There is marked decidual reaction in the stroma, as a rule, and this is easily mistaken for an early abortion. The presence of trophoblasts and chorionic villi is the decisive point in the differentiation of these two conditions. The differentiation from ectopic pregnancy is very difficult and usually has to be made from the history and clinical examination. Fig. 683 shows the microscopic characteristics of the expelled membrane. Fig. 684 shows a remarkable membranous cast which not only outlines the endometrial and cervical cavities but has portions also from the tubal cavities.
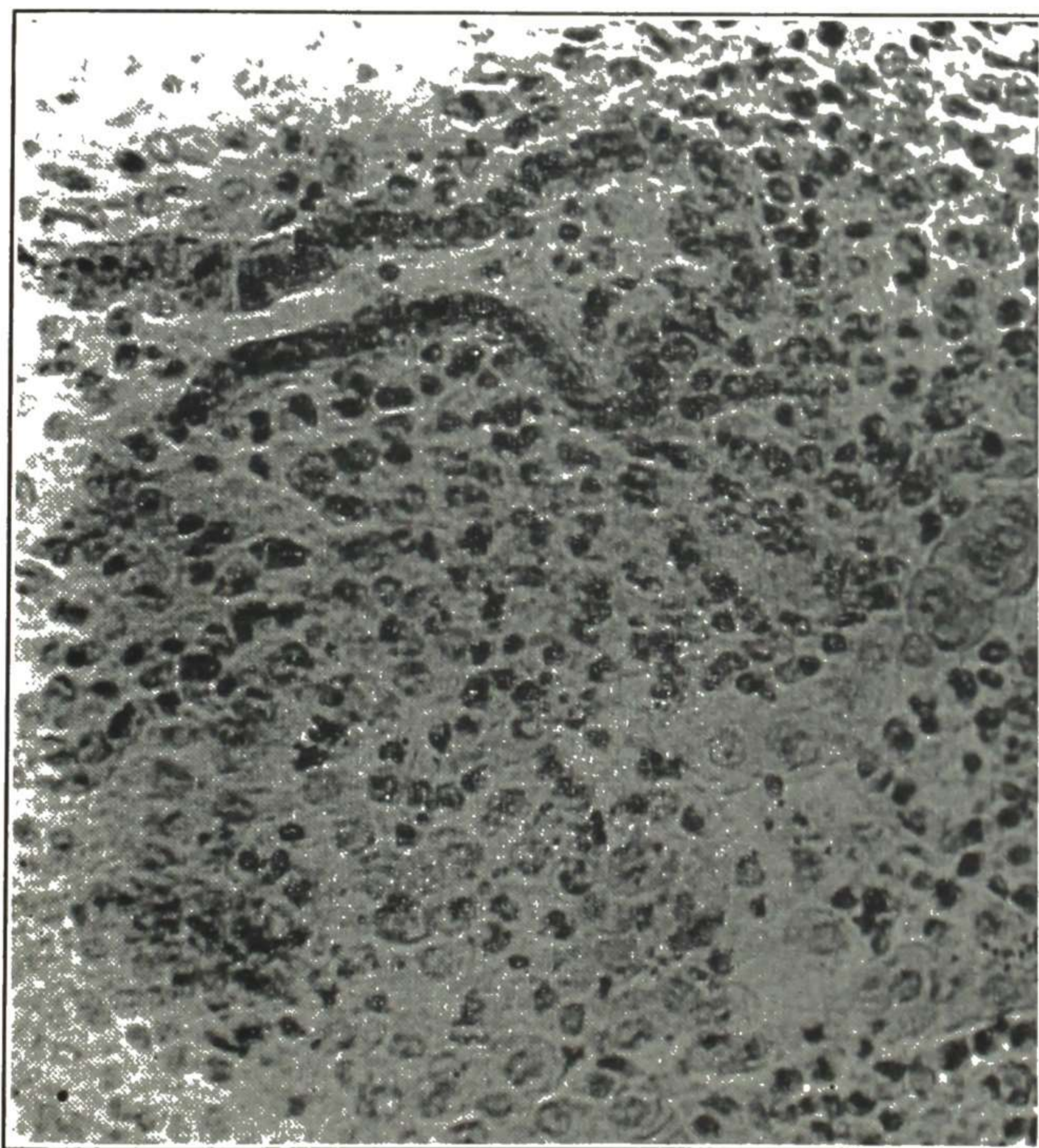

Fig. 683.—Membranous dysmenorrhea. Note the gland in the upper left corner showing beginning disintegration and the ghostlike remains of a gland in the right lower portion of the figure, with its edematous lining cells. Gyn. Lab.

Fig. 684.—Photograph of a remarkable specimen consisting of a membranous cast of the endometrial cavity with cervical and tubal extensions. (The constriction at the upper part of the endometrial portion was produced by string used in mounting.) (Williams—*Am. J. Obst. & Gynec.*)

Diagnosis

In married women membranous dysmenorrhea must be distinguished from early abortion and extrauterine pregnancy, in both of which conditions there may be bloody discharge, with much pain and the passage of shreds of membrane. If this happens to take place near the menstrual time, the patient naturally supposes it is simply a menstruation somewhat delayed. In membranous dysmenorrhea there is usually a history of the expulsion of membrane at several menstrual periods, whereas with abortion there is the history of a missed menstruation and of morning sickness. Also the blood clots are much more numerous in abortion, and with the membrane can usually be found a small sac and embryo. The bleeding from abortion persists indefinitely until

the uterus is emptied, whereas in membranous dysmenorrhea it lasts only about the usual menstrual time. Microscopic examination of an expelled membrane or of shreds removed by curettage in abortion shows chorionic villi. In extrauterine pregnancy there is no previous history of membranous dysmenorrhea and the patient, previously regular, has now gone overtime for one or more weeks. The pain is due to intraperitoneal bleeding, of which it presents the characteristics.

Treatment

The treatment is symptomatic for the pain, and otherwise is largely for complicating or associated conditions. As to curative treatment directed to overcoming the local disturbance of metabolism, endocrine and general nutritional measures are to be considered. Curettage may assist by improving the local nutrition and by overcoming any cervical stenosis which aggravates the painful expulsive uterine contractions.

Some years ago, Lawrence called attention to its frequent association with tubal inflammation, and reported 42 cases of membranous dysmenorrhea in which there was present tubal or ovarian disease requiring operation. In 19 cases the disease was unilateral and in the remaining ones bilateral. In 33 of the 42 cases the trouble appeared, from the history, to have started from an attack of scarlatina, measles, mumps, rheumatism, or smallpox. In nearly all (the report is not definite) there was no further membranous dysmenorrhea after the removal of the pelvic disease. He concludes that membranous dysmenorrhea is due to trophic changes in the endometrium secondary to adnexal disease, and that this adnexal disease is usually a sequela of one of the exanthemas occurring near puberty. He concludes also that the adnexal disease is usually unilateral at first and may be prevented from extending to the other side by prompt attention. As a result of these conclusions, he holds (a) that tubal and ovarian complications occurring with the exanthemas near puberty should be watched for and treated, (b) that in every case of membranous dysmenorrhea a careful history should be obtained with that point in view, (c) that when unilateral adnexal disease is found, prompt operation should be carried out to prevent the trouble becoming bilateral.

ACUTE ENDOMETRITIS

Acute endometritis is acute inflammation due to bacterial invasion of the endometrium and adjacent tissues. Metritis and endometritis in the recently pregnant uterus (puerperal sepsis) are obstetric subjects.

Etiology and Pathology

Nonpuerperal acute metritis is usually due to infection with the gonococcus, as ordinarily this is the only germ that will, on mere contact, implant itself and grow and spread upward in the nonpuerperal genital tract. Gonorrhea involves the cervix in a large proportion of the cases of vaginal gonorrhea. Its extension upward from the cervix to the endometrium may be spontaneous or induced. Spontaneous extension upward may take place immediately following the infection of the cervical mucosa, or the inflammation may remain limited to the cervix for weeks and months, with the possibility of the extension upward at any time. During or immediately following the menstrual flow is the favorite time for the progress upward of the gonococci.

Infection of the endometrium with other inflammatory bacteria (staphylococcus, streptococcus, colon bacillus, etc.) is usually due to sounding the uterus or other intrauterine instrumentation, the germs being carried in from outside the body or from the vagina or from the cervical canal. Endometritis so caused was rather frequent formerly when the uterine sound was passed by touch, but not so now, since the uterus is not so often sounded, and when it is sounded care is taken to do the sounding in an aseptic way.

While extension upward of ordinary pus germs without the intervention of pregnancy or instrumentation is a rare occurrence in the period of functional activity and normal tissue resistance, it occurs more frequently before puberty and after the menopause. Several cases of fatal peritonitis in children from extension upward of streptococci have been reported.

Symptoms and Diagnosis

In the gonorrheal cases, after the vaginitis or cervicitis has continued a few days or several weeks, as the case may be, the patient complains of "cramps" in the lower abdomen and of soreness in the pelvis when walking, and of increased vaginal discharge. Sometimes the pain is quite severe and occasionally the patient is confined to bed for a few days. There may be moderate fever (101° to 102° F.), but the fever is rarely marked as in puerperal endometritis. By close questioning, we can usually obtain a history of symptoms indicating gonorrhea within the last few weeks or months.

If there is any discharge from the cervix or urethra or vulvovaginal glands, spread preparations are made on slides, which can later be stained and examined for the gonococcus. In the form due to ordinary pus bacteria, the symptoms are about the same, with a history of preceding labor or miscarriage or intrauterine instrumentation.

Digital and bimanual examination show that the body of the uterus is tender on pressure. If the disease is still limited to the uterus, there will be no decided tenderness outside the organ. If the trouble has extended to the adnexa, there will be marked tenderness and perhaps a mass about the tube involved. Through the speculum, the mucopurulent discharge may be seen coming from the cervix.

Treatment

The patient should be put to bed, if not there already, and kept at rest until all acute symptoms subside, with the hope of checking the process before it extends to the tubes. Prompt chemotherapy with the sulfonamides, as outlined under gonorrhea, gives the best chance of stopping the process. Local heat or cold application may relieve local pain, or a mild sedative may be required. Lactic acid douches and tablets to restore normal vaginal pH, as detailed under Vaginitis in Chapter IV, will remove the purulent discharge and minimize vaginal irritation.

CHRONIC ENDOMETRITIS AND METRITIS

Chronic endometritis is inflammation of the endometrium due to bacterial invasion. It is not nearly as common as was formerly supposed, when the term was used to cover most of the pathologic conditions of the endometrium and

some of the physiologic. Bacteriologic investigations have shown that it is comparatively infrequent. This relative immunity of the endometrium to chronic inflammation has been ascribed to the fact that it is regularly desquamated at periods, thus tending to cast off any infective agent present. When present it is usually associated with chronic inflammation of the cervix or tubes, due to the original infection, and the important continuing uterine lesion is metritis involving the muscular wall.

Fig. 685.—Chronic metritis. Thickness of entire wall 20 mm. (myometrium 18 mm., endometrium 2 mm.). The thickening is moderate but is due entirely to round cell infiltration and increased fibrous tissue. Gyn. Lab. (Schwarz—*Am. J. Obst.*)

A.
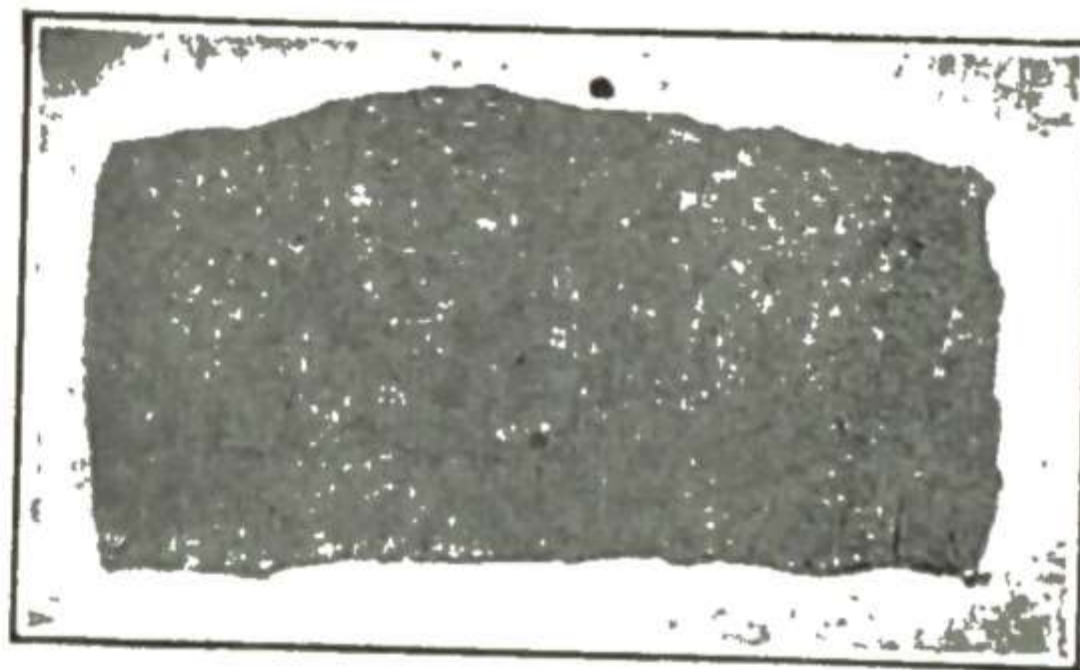
B.

Fig. 686.—Uterine wall from a case of chronic metritis (A) contrasted in thickness with a normal wall (B), the two being magnified alike. In this case the entire wall was 31 mm. thick (myometrium 30 mm., endometrium 1 mm.). The thickness of the wall is from changes due to chronic inflammation. Gyn. Lab.

Pathology

The gross characteristics are shown in Figs. 685 and 686. In the early stages the uterus is large, soft, and boggy, but later it may decrease in size and become very firm. The small sclerotic uterus is of this type.

The microscopic details of chronic endometritis are shown in Fig. 687, the distinguishing feature being the extensive round-cell infiltration composed chiefly

of plasma cells. The plasma cells indicate chronic inflammation, and they are identified by the fragmented nucleus eccentrically placed, shown to some extent in Fig. 687, *B* but shown better (higher magnification) in a section from a tube (Fig. 881).

The microscopic details of chronic metritis are shown in Figs. 688 and 689. Old inflammatory infiltration is present with the characteristic perivascular distribution (Fig. 688), and also a marked increase in connective tissue, especially in the outer third of the wall (Fig. 689, *B*). Puerperal metritis tends to cause
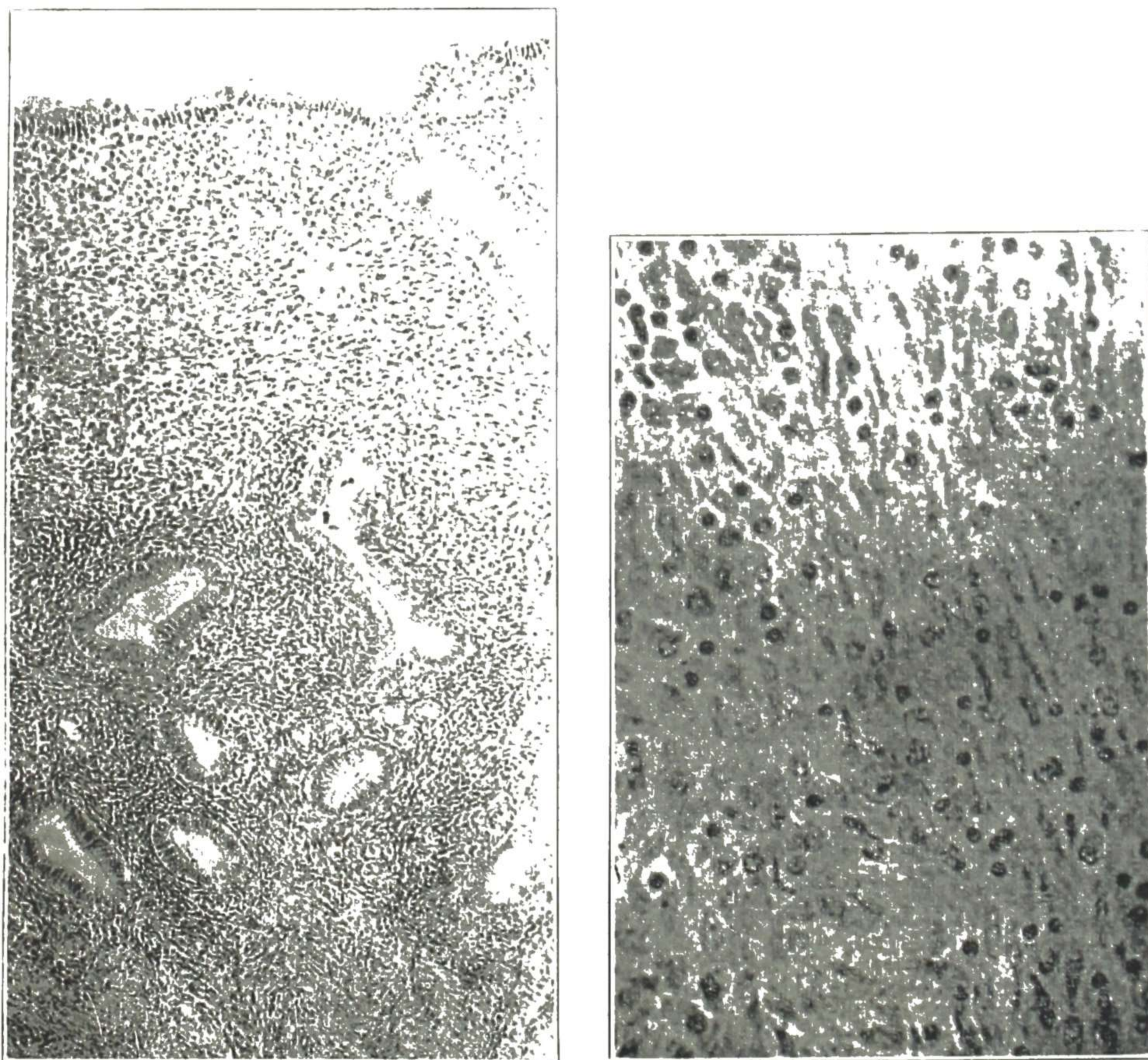
A. *B.*

Fig. 687.—Chronic endometritis. *A*, Notice the foci of round cell infiltration. The glands are practically normal—none of the dilatation and bizarre shapes seen in hyperplasia. *B*, High power of one of the foci in *A*. The infiltration is composed chiefly of small round cells and plasma cells. The plasma cells are seen as rather large cells with a more or less fragmented nucleus eccentrically placed. The characteristic details of plasma cells are better shown in Fig. 881. Gyn. Lab.

subinvolution and hence the two conditions are often found in later sections, but fortunately for a clear picture there is no complicating subinvolution in the sections shown here, the elastic tissue being practically normal and showing none of the degeneration and diffusion characteristic of subinvolution (compare with Figs. 692, 693).
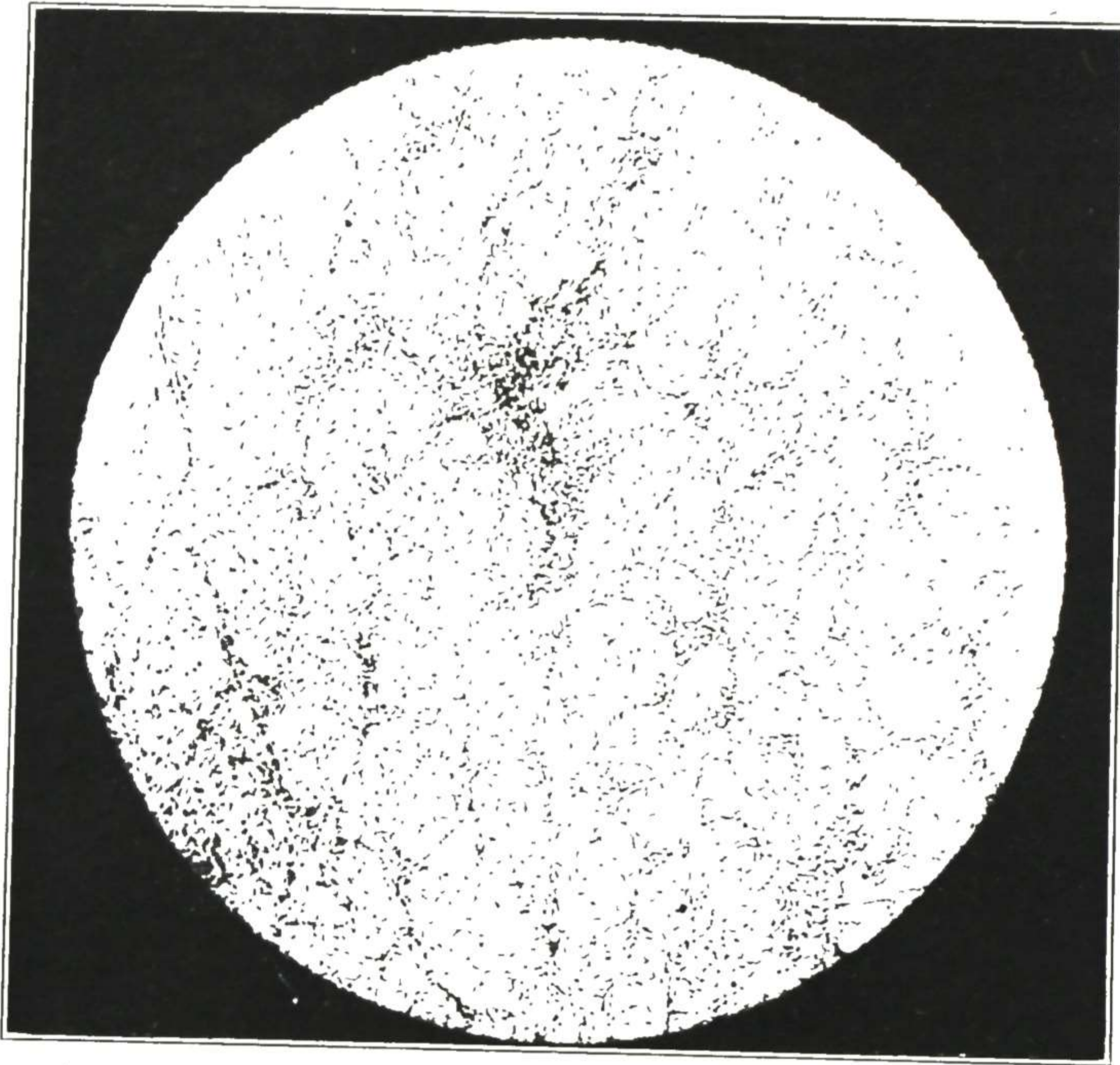
Fig. 688.—Chronic metritis. H & E stain, showing marked round cell infiltration in the myometrium. Gyn. Lab. (Schwarz—*Am. J. Obst.*)

A.

B.

Fig. 689.—*A*, Chronic metritis, middle third. Weigert-van Gieson stain, showing connective tissue increase and the absence of diffused elastic tissue. The connective tissue forms the rather dark network about the lighter staining muscle bundles. Notice the normal distribution of elastic tissue as a fine elastic intima inside the vessel near the center of the field. *B*, Chronic metritis, outer third. Weigert-van Gieson stain, showing increased connective tissue, but without diffused degenerated black-staining elastic substance characteristic of subinvolution. Compare this photomicrograph with the one from a similar portion of the wall in a case of subinvolution, Fig. 788, *B*. The two are stained with the same stain. Gyn. Lab. (Schwarz—*Am. J. Obst.*)

Symptoms and Diagnosis

The patient comes complaining of a vaginal discharge (leucorrhea) which she has had for several months or years. This may be free and troublesome or very slight, and it may be the only symptom. Usually, however, there are menstrual disturbances—painful menstruation, increased menstrual flow, and irregular menstruation. The menses may last a week or ten days, and bleeding between times may appear. Hemorrhage is especially marked when there is an associated hyperplasia or polypoid condition of the endometrium. On the other hand, if the metritis has advanced to the stage of shrinking from scar-tissue formation in the wall, the menstrual flow may be scanty and painful and bimanual examination shows a small sclerotic hypersensitive uterus, the so-called "irritable uterus."

Treatment

Vigorous endocrine treatment may relieve the subjective disturbances some, though not much organic change can be expected in a sclerotic uterus. Otherwise treatment is symptomatic. If there is discharge and excessive menstrual flow in spite of medication, curettage may be indicated as a therapeutic measure, and it may be required before that as a diagnostic measure to exclude cancer. When, in spite of other measures, there continues a persistently hypersensitive and disabling uterus, hysterectomy may be required to give relief.

SUBINVOLUTION OF UTERUS

Subinvolution is the term applied to that condition of the uterus found in cases in which, after labor or abortion, it fails to return to its normal size. It remains large and heavy, and its walls are greatly thickened (Figs. 690, 691).

Etiology

As mentioned at the beginning of this chapter, there is a group of organic disorders of the uterus which has occasioned considerable difficulty in classification because not due to the commonly recognized causes of structural change, such as infection, traumatism, tumor formation, or developmental defect.

On consideration it is evident that each of these disorders is due to some marked disturbance in the local metabolism—so marked as to produce structural change. This furnishes a basis for group designation, and also indicates the direction in which to look for the underlying etiologic factor. This group includes subinvolution of the uterus, hyperinvolution of the uterus, hyperplasia of the endometrium, and hypertrophy of the myometrium.

Subinvolution is due to some interference with the retrograde changes that normally follow labor. These retrograde changes that normally take place consist of atrophy of the muscular and connective tissue. Fatty degeneration, which was formerly supposed to occupy such a prominent place in the process, has been found to be a subordinate feature. The retrograde changes may be interfered with by anything that prevents proper contraction and retraction of the uterus or that causes chronic congestion.

A uterus which becomes infected after labor does not return to its normal size unless the infection is overcome. Retained membranes or placental rem-

nants also interfere with the process of involution, even without infection. General diseases, producing an impoverished condition of the blood may, following labor, so interfere with the nutrition of the uterus as to cause subinvolution. Retrodisplacement of the uterus after labor or abortion is a factor in subinvolution, which is favored by anything which interferes with the circulation or the
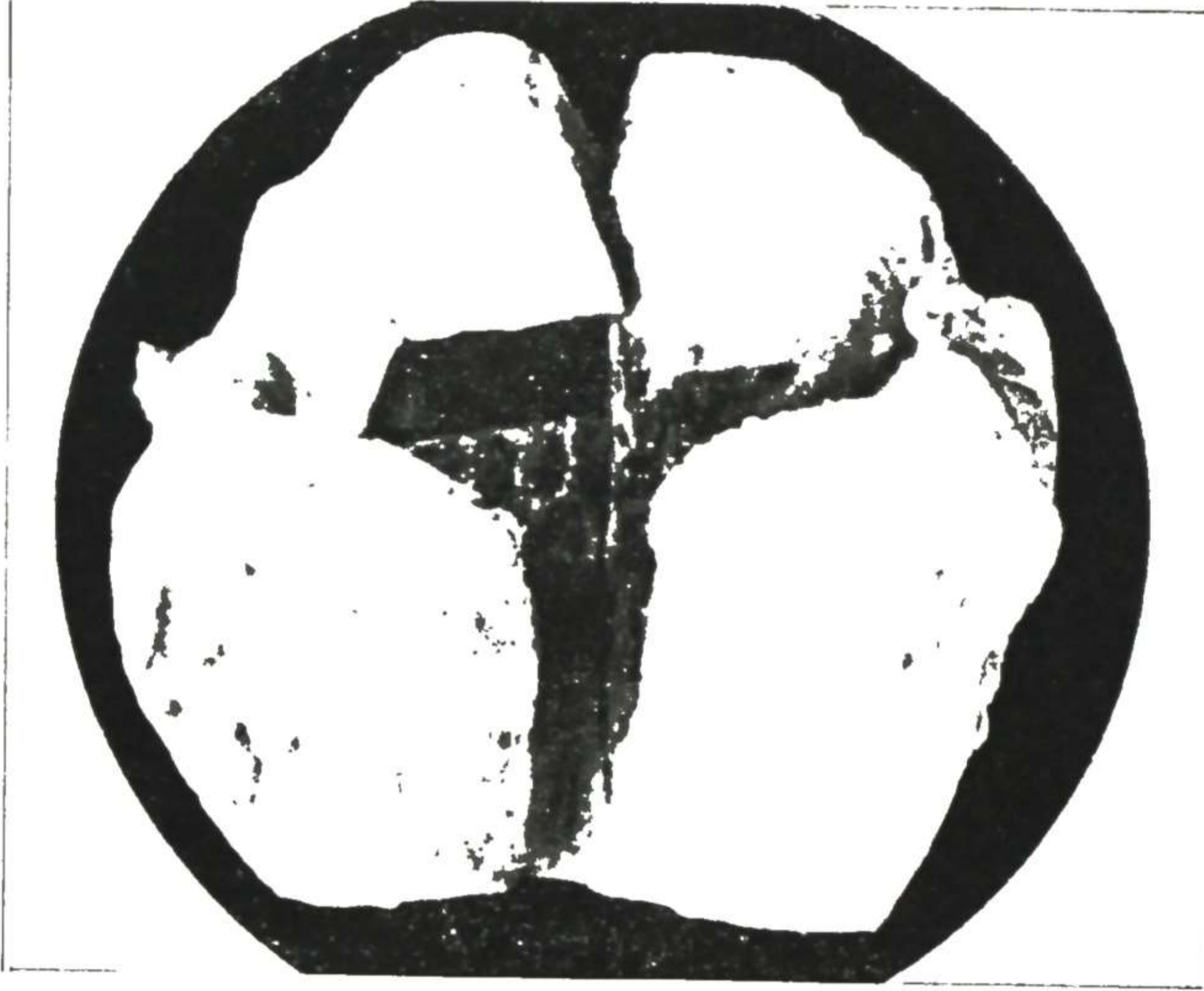

Fig. 690.—Subinvolution of the uterus. Gross specimen, showing marked thickening of the uterine wall and numerous large thickened projecting vessels. Gyn. Lab. (Schwarz—Am. J. Obst.)

A.

B.
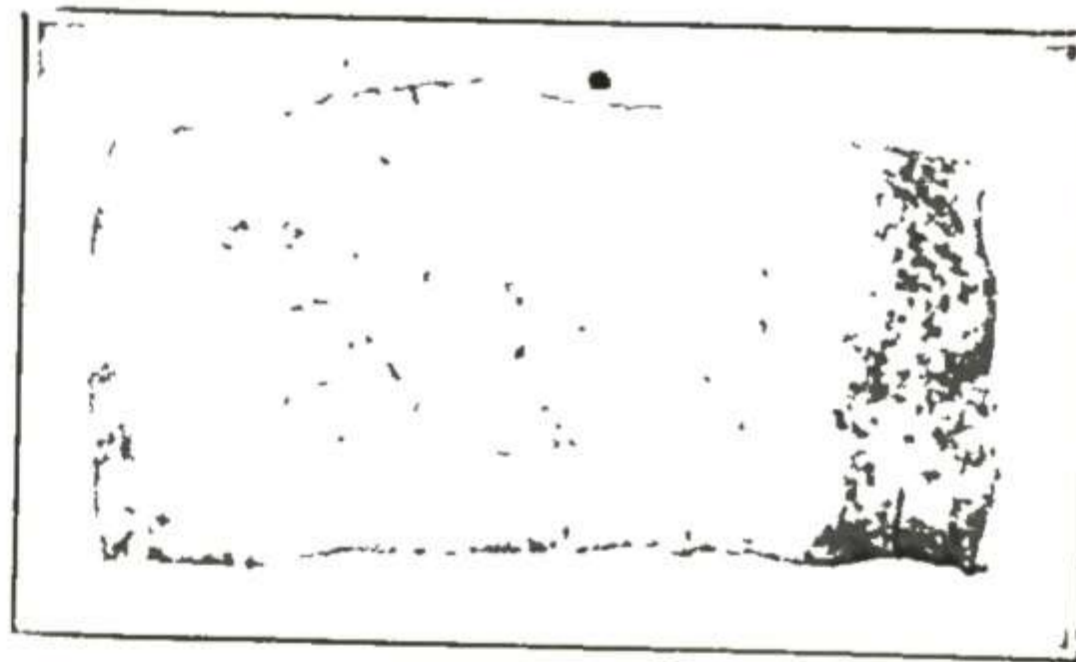
Fig. 691.—Uterine wall from a case of chronic subinvolution (A) contrasted in thickness with a normal wall (B), both being magnified to about the same extent. In this case of subinvolution the uterine wall was 40 mm. thick (myometrium 31 mm., endometrium 9 mm.). The thickness of the wall is due chiefly to subinvolution abnormalities of vessels and muscle and connective tissue. Gyn. Lab.

metabolic processes by which waste products are removed and nutriment supplied to the elements of the uterine wall. The uterine-contraction stimulus furnished by nursing is probably a factor in normal involution, and its absence a factor in subinvolution.

Pathology, Symptoms, Diagnosis

Subinvolution is, at best, a relative term, for every parous uterus shows some evidence of "subinvolution." There is never a complete restitution to the virginal uterus. With succeeding pregnancies there is an increasing amount of connective tissue deposited, while the blood vessels seldom regress to their former condition.

In typical subinvolution the uterus is enlarged to a varying degree (Figs. 690, 691). On section the musculature appears coarse and the blood vessels stand out above the surface (Fig. 690). Microscopically there may be a preponderance of connective tissue, and there is usually some lack of uniformity, the involution being more advanced in some parts than in others. The endometrium may or may not be thickened.

The most characteristic microscopic pathologic changes are seen in the blood vessels and are explained and illustrated in Figs. 692 to 694. In normal involution the enlarged vessels are partially or completely obliterated by an increase in the elastic tissue fibers of the intima and media. This tissue then becomes hyaline and is absorbed. In subinvolution the process may be halted at any stage, giving rise to vessels with immensely thickened walls and often very irregular shapes. The great thickening in the vessels is due largely to the remaining unabsorbed elastic tissue.

The symptoms of subinvolution are simply a sense of weight and pressure and weakness in the pelvis, with menstrual disturbances (usually increased flow). As a rule, the most prominent symptoms are those due to complications, such as hyperplastic endometrium, infected metritis or retrodisplacement. In practically all cases of infection following labor or abortion there is more or less subinvolution.

The enlarged uterus is usually found low in the pelvis and not particularly tender, unless there is a complicating metritis. The uterus may be retroverted, and there is often laceration of the pelvic floor. The history connects the trouble with a previous labor or miscarriage.

Prophylaxis of Subinvolution

Subinvolution is one of those diseases which may, in a measure, be anticipated and often prevented. The measures to be employed in the puerperium to avoid subinvolution are as follows:

1. Prevent infection following labor or abortion by careful attention to asepsis.

2. See that the uterus is emptied of placental remnants and membranes.

3. Repair all lacerations of the pelvic floor. Unrepaired lacerations of the cervix also favor infection and subinvolution.

4. Keep the uterus fairly well contracted. If it shows a tendency to remain unduly relaxed during the puerperium, tone it up by proper medication.

5. Prevent retrodisplacement of the heavy puerperal uterus and improve its circulation by the routine use of the knee-chest posture at the proper time in postpartum care. As explained under knee-chest posture in Chapter III,

Fig. 692.—Subinvolution. Weigert-van Gieson stain. Vessels of the inner third of uterine wall. The old subinvoluted vessels are seen staining as black collars around the new smaller vessels which have come up into the lumen of these old degenerated ones. On account of a block in the absorption of these old vessels there remains diffused degenerated elastic tissue, which retains the power of staining black with Weigert's stain. Gyn. Lab. (Schwarz—*Am. J. Obst.*)

Fig. 693.

Fig. 694.

Figs. 693 and 694.—Subinvolution. Weigert-van Gieson stain. Fig. 693, Vein of middle third of uterine wall. The black staining shows that the unabsorbed degenerated elastic tissue has diffused through most of the vessel wall, a condition characteristic of subinvolution. Fig. 694, Outer third of uterine wall, showing the amount of diffuse dead elastic tissue between the muscle bundles, due to lack of absorption of this degenerated material during the process of involution. Gyn. Lab. (Schwarz—*Am. J. Obst.*)

there is danger in employing it in the early postpartum period, when reliance should be placed on having the patient lie on the abdomen or side. But by four to six weeks postpartum, the reparative processes have advanced so that the knee-chest posture may be added safely and with decided benefit to the position of the uterus and to the pelvic circulation.

This point of prophylaxis by correction of retrodisplacement is strongly emphasized by O. H. Schwarz, who made a special study of subinvolution, confirmed the work of Fletcher Shaw in regard to elastic tissue diffusion, as beautifully shown in Figs. 692 and 693, and contributed several instructive articles as indicated in the Reference List.

6. Lessen pelvic congestion by overcoming constipation, removing any irritating discharge with douches, prescribing periods of rest during convalescence and continuing the knee-chest posture as long as there is any tendency to retrodisplacement.

Treatment

The principal disturbances accompanying subinvolution come from the associated diseases; consequently the treatment is directed largely to the associated conditions. The following measures tend to tone up and improve the condition of the uterine wall:

1. Improve local tissue nutrition and circulation by building up general health with vitamins, endocrines, and other indicated medication.

2. Curettage is the most effective local measure for influencing the circulation and nutrition of the uterine wall. Curettage should be followed by the other remedial measures, such as douches, laxatives, uterine astringents internally, and local measures indicated. Treatment for cervicitis, restoration of pelvic floor support or operation for uterine prolapse or retrodisplacement may be required.

HYPERINVOLUTION OF UTERUS

Hyperinvolution is a very rare condition in which the process of involution following labor does not stop at the normal limit, but continues until the uterus is much reduced in size. The uterus sometimes becomes so small as to measure only an inch in depth. The cause of this trouble is deficient ovarian function. Obviously the condition in its more aggravated form is associated with amenorrhea.

Some years ago the senior author saw an interesting case of hyperinvolution of the uterus and adnexa. The patient was thirty years of age. Three years previously she had had a severe infection following the birth of her child, and there had been no menstruation since. Pelvic examination showed the uterus to be very small. On account of other trouble it was necessary to open the abdomen, and thus the opportunity was given of inspecting the internal genital organs. All of them were atrophic—the ovaries, uterus, tubes, and round ligaments. The uterus was about half normal size.

Treatment. The hope of improvement lies in endocrine treatment. The striking results obtained with judicious use of endocrines (growth and estro-

genic) in underdeveloped uteri encourage the trial of such treatment for uteri which have receded from a former functioning condition. Kaufmann and also Clauberg have shown that an atrophic uterus may sometimes return to normal size under the use of estrogenic hormones.

HYPERTROPHY OF MYOMETRIUM

This condition consists of a uniform hyperplasia of the myometrium. The muscle fibers as well as the fibrous tissue take part in the hyperplasia. The diagnosis can be made only in uteri where previous inflammation and pregnancy can be excluded. There is no inflammation or subinvolution. There may or may not be an accompanying hyperplasia of the endometrium. The work of Kaufmann and of Clauberg, previously referred to, showing that atrophic

Fig. 695.—Hypertrophy of myometrium. Gross specimen from a nullipara, aged forty-one years. The endometrium is only 3 mm. in thickness and shows moderate hyperplasia. The myometrium is 19 mm. thick and the increased thickness is due entirely to hypertrophy of the muscle and connective tissues. Gyn. Lab. (Schwarz—*Am. J. Obst.*)

uteri can be made to return to normal size by use of the estrogenic hormones, would point to an excess of estrogen as one of the factors in hypertrophy.

The muscle fibers are the same as those found in a normal uterus with the exception that they are longer and a little larger. The vessels are numerous but contain none of the degenerated elastic material characteristic of subinvolution. A gross specimen of this rare condition is shown in Fig. 695, and the microscopic characteristics are shown in Figs. 696 and 697.

If the condition should cause disturbance, the treatment would be the same as for a troublesome uterus enlarged from subinvolution or metritis. In fact, the diagnosis of myometrial hypertrophy, instead of the more common causes of uterine enlargement, could be established only after removal and microscopic investigation of the enlarged uterus.

Fig. 696.—Hypertrophy of myometrium, with some hyperplasia of endometrium, from nullipara, aged nineteen years. No subinvolution and no infection (see Fig. 697). Thickness of wall 24 mm. (myometrium 19 mm. and endometrium 5 mm.). Gyn. Lab.

Fig. 697.—Hypertrophy of myometrium. High power of Fig. 696. Weigert-van Gieson stain, showing normal nulliparous distribution of elastic tissue, connective tissue, muscle tissue, and muscle. In the original, the elastic tissue is stained black and of course reproduces black in the photomicrograph. Notice the normal distribution as a thin, clear-cut elastic intima inside the blood vessels. The connective stains red and the muscle tissue yellow. The former reproduces as a rather dark network surrounding the lighter staining muscle bundles. Gyn. Lab.

SENILE ATRESIA OF UTERINE CANAL

In this condition, apparently largely nutritional, senile atrophy of the uterus with elimination of the endometrium continues to the point of atresia of the canal and obliteration of more or less of it. It is quite different from the inflammatory atresia found with pyometra, which may occur at any age and is rather frequent with advanced carcinoma.

The senile atresia here referred to presents no inflammatory symptoms or signs. The sides of the canal lose their protective mucosa at points of contact and the opposed surfaces adhere. As there are no symptoms, the process is of importance principally from the pathological standpoint. It is found occasionally at autopsy, usually in individuals of advanced age. It is encountered at times when endeavoring to dilate for curettage in an aged patient presenting some indication for intrauterine investigation.

It may be accompanied with cystic change in the thinned endometrium, in which case it is designated occlusive cystic atrophy ("endometritis atrophica cystica" of former times). Fig. 698 shows this condition in an autopsy specimen, with reproduction in exact size of the uterus and the cysts and the occluded portion of the canal.

Fig. 698.—Atrophic (senile) atresia of the uterine canal. This autopsy specimen from an aged woman presents also an unusual number of retention cysts from occlusion of atrophying endometrial glands. This condition was formerly designated "atrophic cystic endometritis," but we know now that inflammation, if present, is only incidental and that senile atrophy is the essential feature.

Knowledge of this occasional atrophic occlusion of the canal in the aged is important in interpreting the findings when an attempt at diagnostic curettage is blocked at the internal os. Gyn. Lab.

TUBERCULOSIS OF THE UTERUS

This term is applied to tuberculous disease of the uterine mucosa and myometrium. When the tuberculosis affects only the peritoneal coat of the uterus, it is classed as peritoneal tuberculosis.

Etiology and Pathology

Tuberculosis of the uterus usually comes from tuberculosis of the tubes. Occasionally it is due to infection from without, in which case it may come from tuberculosis of the external genitals.

It may be produced by coitus with a tuberculous husband, the tuberculosis in the husband being located in the genitourinary tract. It is possible for the infection to be carried in this way when the husband has only pulmonary tuberculosis, for tubercle bacilli have been demonstrated in the comparatively healthy testes and semen of phthisical patients. Infection conveyed

by coitus may be first manifested in the cervix or in the body of the uterus. It is held by some that such infection may be found first in the fallopian tubes. Tuberculosis of the uterus sometimes occurs as a part of a general infection, secondary to pulmonary tuberculosis.

Tuberculosis, unlike gonorrheal infection, usually descends from the tubes (Fig. 699) or even the peritoneal cavity. Tuberculosis of the uterus and cervix is, therefore, usually secondary to tuberculous salpingitis. It may, however, be blood borne. In the uterus it affects primarily the endometrium. It is found in about 50 per cent of patients with genital tuberculosis. This fact of probable uterine involvement should be kept in mind when extensive tubal tuberculosis is encountered in an operation.

Fig. 699.—Tuberculosis of the endometrium. Gross specimen, showing the thickened endometrium, and also the accompanying tubes which were tuberculous. From a white woman in whom a part of the right tube had been removed in a distant city some years before and found tuberculous. Notice the stump of right tube in the photograph of the specimen. Gyn. Lab.

In the stage of caseation it shows areas of caseous necrosis which may be confused with sarcoma or carcinoma of the endometrium. The differential diagnosis depends on microscopic examination.

Tuberculosis of the endometrium is easily diagnosed by finding tubercles and giant cells in the endometrium (Figs. 700, 701). The early cases have the tubercles in the stroma, but as these enlarge and become conglomerate and caseous, mass destruction of both glands and stroma occurs. Schroeder believes that the deeper layers become infected during menstruation.

Symptoms and Diagnosis

The symptoms of tuberculosis of the endometrium are principally those of a severe chronic endometritis. There is nothing particularly distinctive in the clinical evidences of tuberculous endometritis. A severe endometritis occurring in a virgin should arouse suspicion of tuberculosis. A persistent and severe chronic endometritis in the presence of peritoneal or tubal tuberculosis, or occurring in a patient with phthisis, is possibly tuberculous. The diagnosis is made by finding tubercle bacilli in the pus or finding characteristic changes in the scrapings from the uterus.

Fig. 700.

Fig. 701.

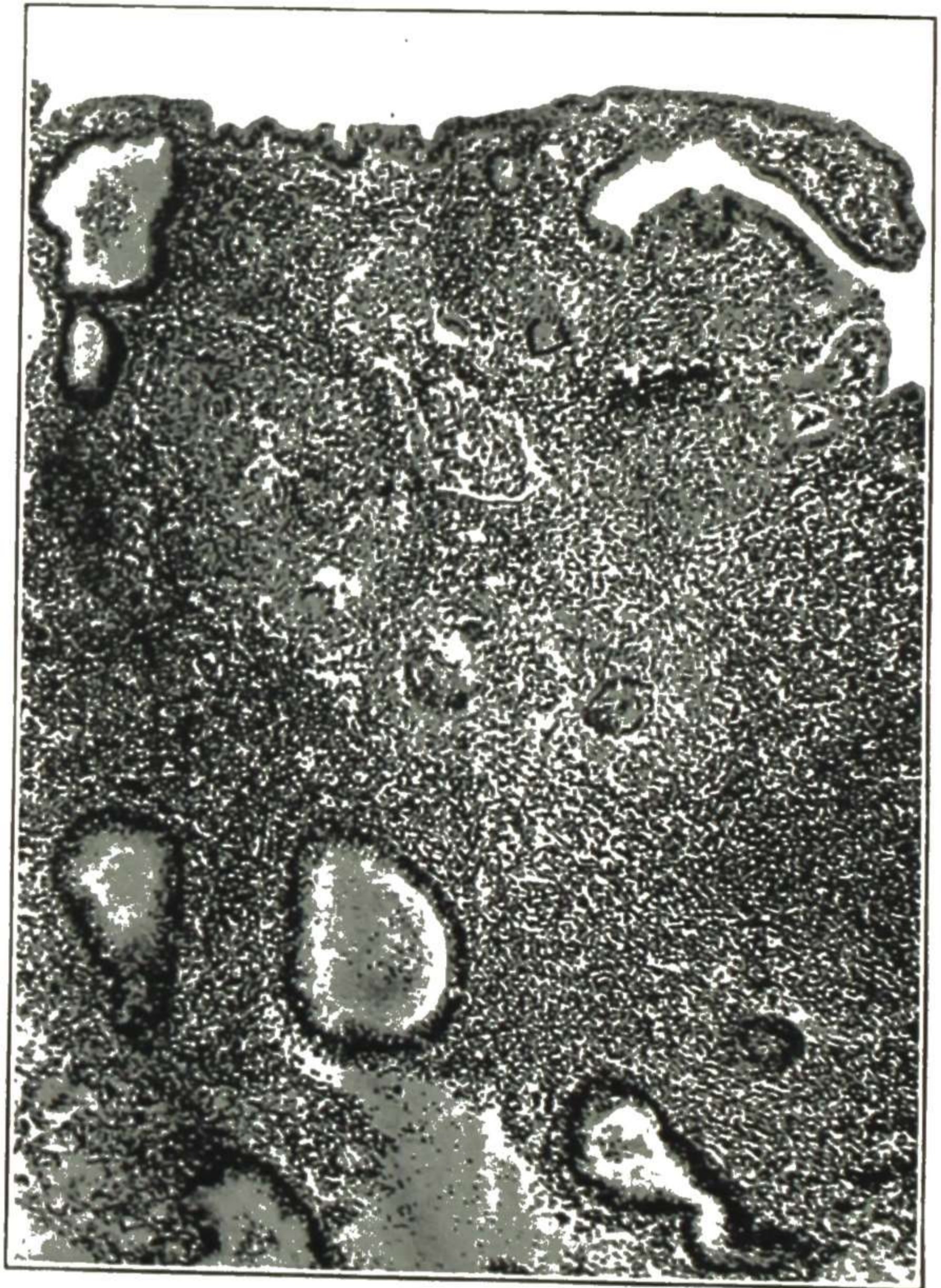Fig. 700.—Tuberculosis of endometrium, low power. A tuberculous area in the endometrium is well shown.

Fig. 701.—Tuberculosis of endometrium. High power of a section from Fig. 700, showing typical tubercles and giant cells. Gyn. Lab.

Treatment

In all cases, general antituberculosis treatment is indicated. Tuberculosis of the lower part of the cervix alone calls for amputation of the cervix or hysterectomy. Tuberculosis of the body of the uterus indicates hysterectomy, provided there is no other involvement, e.g., advanced phthisis or very extensive peritoneal involvement. A moderate involvement of tubes and pelvic peritoneum is not a contraindication to operation, provided the patient is in a fair general condition. In cases in which the patient is not in fit condition for radical operation, or refuses it, the case is treated on the same general principles as chronic endo-

metritis, that is, by curettage, followed, if necessary, by antiseptic and astringent applications. Iodoform should be used freely, in powder or emulsion or as soluble bougies. While a cure may, in some cases, follow this mild treatment, its attainment is very uncertain, and owing to the impossibility of determining the limit of the uterine infiltration and owing also to the fact that the infiltration is very likely to spread in spite of all treatment, hysterectomy is the safer plan and the one to be advised in operable patients.

SYPHILIS OF THE UTERUS

In a most exhaustive monograph Gellhorn and Ehrenfest have presented the entire problem of the involvement of the internal female genitals by syphilitic infection. Our actual knowledge concerning the syphilitic lesions of the uterine body is extremely meager. Primary and secondary manifestations have not been observed in the uterus. There are a few instances on record of gumma in the uterine wall, also of a gummatous endometritis. This infrequency of tertiary lesions is rather a matter of surprise, for the uterus, more than any other internal organ of the body, is exposed to direct infection. Spirochetes may reach the endometrium from the vagina or from cervical lesions. Spirochetes, at least during pregnancy, undeniably circulate through the uterine wall as is proved by the fact that an actively syphilitic mother invariably infects the fetus in the uterus. Syphilis is a common cause of abortions.

The cervix is probably rather frequently the site of the primary chancre, but it is not likely to cause much discomfort and hence is seldom seen. Under Ulcer of Cervix in this chapter reference is made to a patient with an early syphilitic lesion of the cervix which had been mistaken for cancer and treated with radium. Of practical importance also is the fact that a tertiary gummatous nodule may develop in the cervix. The microscopic characteristics of the tissue changes in syphilitic lesions of the cervix are illustrated in Figs. 661 and 662.

ECHINOCOCCUS DISEASE OF UTERUS

Echinococcus disease affecting the uterus is a curiosity, and yet it is not so rare that it can be ignored in diagnosis. Undoubted cases have been reported in early life and in middle life and later. The liver is the organ usually affected in echinococcus disease. Many other organs, however, have been affected, with or without coincident affection of the liver, and among the organs occasionally affected is the uterus.

When echinococcus disease attacks the uterus (Fig. 702), there is nothing especially characteristic in the symptoms. The disease, at first, may resemble chronic endometritis with hemorrhagic tendency. As the cysts become larger, a tumor or several tumors become palpable, and the case may be considered one of uterine fibroids. When the masses become still larger, fluctuation may be detected or rupture into the uterine cavity may take place with the discharge of clear fluid and hooklets (Fig. 703) and daughter cysts. If rupture takes place into the peritoneal cavity, fatal peritonitis is probable. The process may stop at any stage and the lesion undergo partial absorption. Suppuration may take place in the lesion, forming abscesses. In some cases the symptoms resemble pregnancy, as mentioned by Reed, as follows:

"In cases of echinococcus infection of the uterine cavity, the symptoms may be essentially those of pregnancy. The uterus becomes enlarged and softened, the cervix presenting a bluish aspect. The womb enlarges, progressively and symmetrically, the breasts enlarge and may contain milk, while there are, not infrequently, reflex disturbances of the stomach. It is the occurrence of these symptoms which has generally caused infections of the uterine cavity by echinococcus to be looked upon as pregnancy, and the resulting cysts to be designated as degenerated ova. In practically all of these cases, however, the usual amenorrhea of pregnancy is absent, while the patient complains of more or less constant dribbling of blood from the uterus. While this is true, the fact must be recognized that infection of the uterine cavity may coexist with pregnancy, as was true in MacNeven's case, in which a large echinococcus cyst was expelled intact, during a true labor and immediately preceding the rupture of the amniotic sac. The exact diagnosis cannot be made without the demonstration of the hooklets."
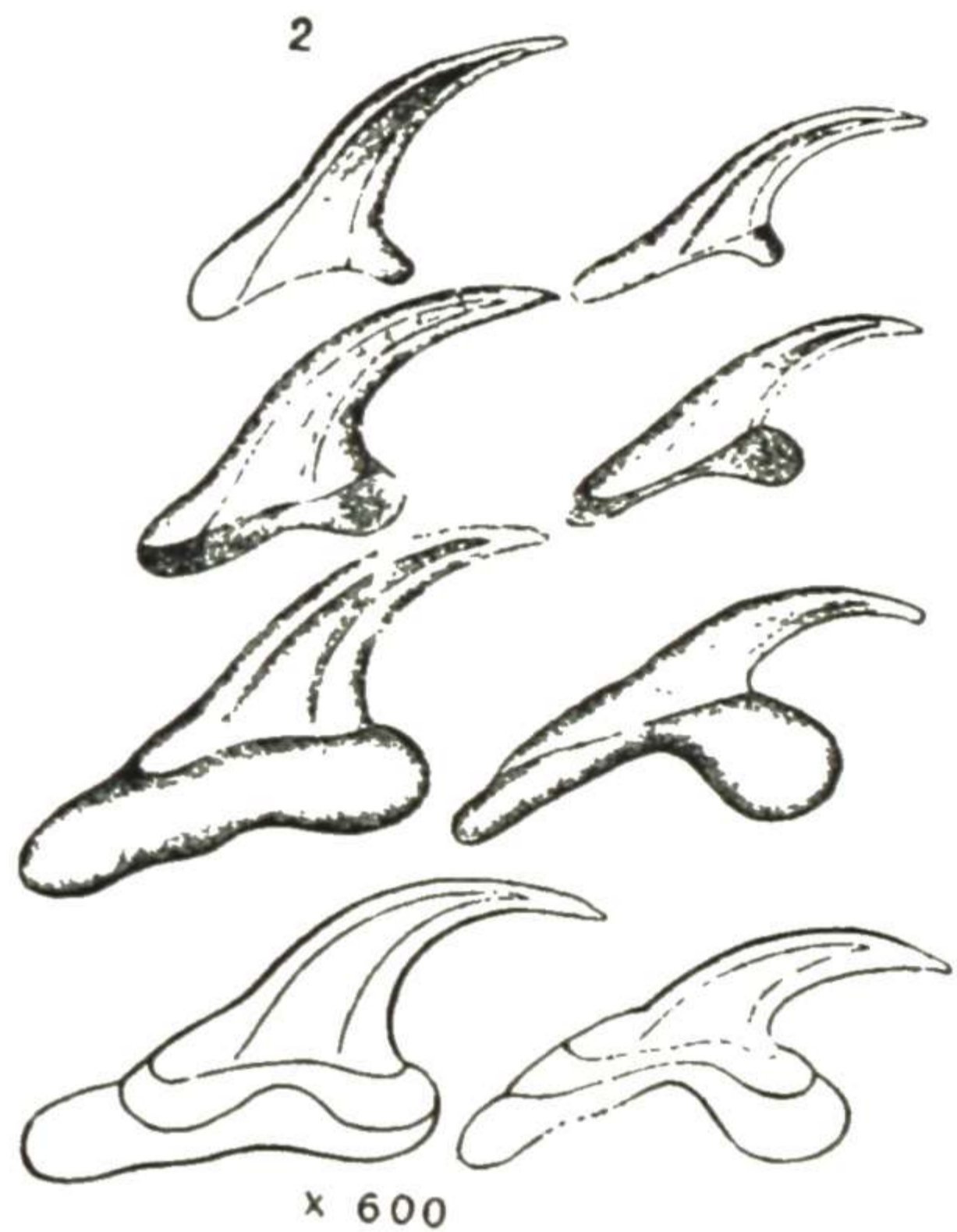

Fig. 702.

Fig. 703.

Fig. 702.—Echinococcus disease of the uterus. Gross specimen showing an echinococcus cyst of the uterine wall. (Turenne—*Surg., Gynec. and Obst.*)

Fig. 703.—Echinococcus hooklets. The diagnosis of echinococcus disease depends upon finding these characteristic hooklets in the cyst fluid.

Echinococcus disease of the uterus must not be confounded with the more common "hydatidiform mole," in which small cysts of varying size are found, and may be expelled in a large mass. The two affections are entirely distinct. The first (echinococcus disease) is due only to the echinococcus parasite in the uterus, while the second (hydatidiform mole) is due to degenerative changes in fetal membranes—the chorionic villi proliferating and becoming distended with fluid so as to form a mass of little cysts.

The differential diagnosis between echinococcus disease and hydatidiform mole is made by microscopic examination of pathologic structures—hooklets being found in the first and chorionic villi in the second.

The treatment of echinococcus disease of the uterus consists in the rupture and continual drainage of all cyst cavities. If the disease persists and is not associated with some contraindicating lesion, hysterectomy is indicated.