

Wilson (H. P. C.)

Compliments of the Author.

THE THERMANTIDOTE

AN INSTRUMENT FOR PREVENTING THE EVIL
EFFECTS OF HEAT FROM PAQUELIN'S
THERMO-CAUTERY WHEN OPE-
RATING IN DEEP CAVITIES.

—BY—

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OF MEDICINE, AND OF THE MEDICAL AND CHI-
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IN DEEP CAVITIES.

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Mr. President and Gentlemen:

My subject to-day is the Thermantidote, an instrument which we have devised for *preventing* the evil effects of heat from Paquelin's thermo-cautery, when operating in deep cavities.

I read before the Baltimore Academy of Medicine, on October the 15th, 1878, an account of my first operation with this instrument, in amputating the cervix-uteri for epithelioma. I there described the difficulties I had, in preventing the shaft of the knife from burning the vulva and vagina, although I had it encircled with wood. With all my care the wood was charred, and became so hot as to burn the above parts to such an extent as to give more pain and trouble afterwards than the stump of the amputated cervix. The heat was sufficient to nearly burn up the wooden sheath about the shaft of the knife; and from this

experience I was satisfied, that more efficient means, for counter-acting the evil effects of heat, than those used in this instance, would have to be adopted, or Paquelin's cautery would be of very little use for operations in deep cavities,—such as the vagina mouth, rectum and abdomen.

I had seen this objection to the instrument for operations in cavities, before ever using it, and adopted the sheath of wood, as the best applicable non-conductor of heat, with which to protect the shaft of the knife from burning the soft parts, (both by contact and radiation) between the external labia and os uteri.

In a subsequent operation for amputating the cervix, other means were used in addition to the wooden sheath, such as wet felt laid around the walls of the vagina, and covering the labia, wet cotton, tinfoil, &c., but they were worse than useless; became displaced, and in the way of the operator; generated so much steam as to obscure the seat of operation; or became so hot, as to burn by contact.

Asbestos was next tried, as one of the best non-conductors of heat, by binding it around the shaft of the thermo-cautèr. It was found to protect the parts very well for about three minutes, and then became nearly as hot as the shaft beneath, and of course inefficient for any lengthy operation.

These operations were performed with Sim's speculum; and it may occur to some present, that if another form of speculum had been used (as a cylindrical, bi-valve, or quadri-valve), the soft parts would have been protected, and the operations on the cervix might have been equally successful. This is not so. The walls of the vagina will fall in between the blades of bi-valve and quadri-valve speculums, sufficiently to be burned by the shaft of the knife, in the manipulations necessary for amputating the cervix; or the speculums will become so hot as to blister the whole vagina and vulva.

Moreover, no speculum, which completely surrounds the entrance to the vagina, will allow that free play of the knife in the hand of the operator, which is obtained by the use of Sim's speculum; and which is so essential to a thorough excision of

the cervix, or polypoid and sessile tumors, about the neck of the uterus, or walls of the vagina.

For these reasons my mind has been greatly exercised to devise some means by which to counteract the evil effects of heat, from this most valuable instrument, when operating in deep cavities, with soft parts liable at any moment to come in contact with the shaft of a red hot knife.

To Mr. Willms, the surgical instrument maker at No. 79 North Howard Street, Baltimore, so well known to all physicians of this city, for his ingenuity, integrity, and accommodating manners, I am greatly indebted for the result which I lay before you to-day.

When we failed to counteract the evil effects of heat from Paquelin's thermo-cautery, by the wooden sheath and asbestos around the shaft of the knife, and wet felt, wet cotton, and tin foil protecting the walls of the vagina and external labia, my mind was for a time directed to devising a speculum, (notwithstanding they are already counted by dozens), which would keep cool all the external and internal soft parts, except the points on which we desired to operate the hot knife.

Such a speculum could have been easily invented, whose blades or cylinder could have been kept cool for any length of time, and which, in turn, would have kept cool the soft parts adjacent thereto.

A cylindrical speculum could have been made with a coil of metallic tubing, through which we could have kept constantly flowing, a stream of cold water. Or a bi-valve or quadri-valve speculum could have been planned, with each blade hollow, so as to allow a current of cold water, passing through the same, to keep speculum and subjacent tissue at any temperature desired.

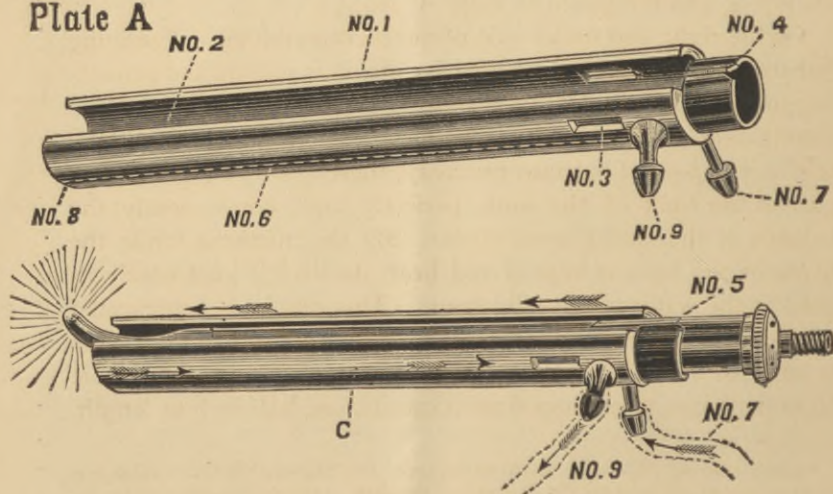
The speculum idea of counteracting the evil effects of heat, when using this instrument in the vagina, was speedily abandoned, because any speculum which was not a univalve (such as Sim's), would not allow that free play of the knife which is so essential to successfully operating within the vagina. The blade of a Sim's speculum could be made hollow, and kept cool as above, but it would then only protect the posterior vaginal wall;

while above, below, anteriorly, within and without, the soft parts would be subjected to intense heat.

Thus we were forced to return to our original idea of encasing the shaft of the thermo-cautèr with a heat protector; and to abandon the thought of guarding the walls of the vagina with a speculum. We have succeeded in devising an instrument which will thoroughly protect the vagina, and all the soft parts about the vulva, from the evil effects of heat in the use of Paquelin's cautery. In operations with this instrument in any deep cavity (as the rectum, mouth, and abdomen), all the parts adjacent to the point of operation, will be perfectly safe against the injurious effects of heat.

This instrument, for want of a better name, we shall call the Thermantidote, in contradistinction to the thermo-cautèr. It is a hollow cylinder, of sufficient size, to allow the shafts of Paquelin's knives to slip easily into it. (As may be seen at Plate A. No. 1.) It is made of German silver,— $5\frac{1}{4}$ inches in length. On

Plate A



its upper surface, for its whole length, is a fenestrum of one-fourth of an inch. (As seen at Plate A. No. 2.) This fenestrum is necessary to allow the insertion of a curved knife, such as No.

9 in Collin & Co's catalogue of the Thermo-cautery. *In order to give sufficient air to the shaft of the knife, we have provided fenestra in the Thermantidote, corresponding to the fenestra in the shaft of the thermo-cautèr. (As seen in Plate A. No. 3.)

The Thermantidote increases the diameter of the shaft of the thermo-cautèr, 4 m. m. only. Its near extremity is provided with a flat circular spring, 9 m. m. wide, (as seen in Plate A. No. 4), for the purpose of manipulating the Thermantidote backward and forward, and fixing it at any point on the shaft of the cautèr, so as to allow the surgeon to use any desirable portion of the end of the knife. In order to prevent the thermantidote from turning on the shaft of the thermo-cautèr (by which the manipulations of the operator would be embarrassed), the upper portion of this spring is left open to receive a guard, which is attached to the top of the shaft of the knife. This guard is 35 m. m. in length, and 2 m. m. in width, and effectually prevents any rotation of the antidote on the cautèr. (The spring is seen in Plate A. No. 4, and the guard in Plate A. No. 5)

On the right, and under side of the thermantidote, and running between its two plates, is a canula five inches in length, and projecting an half inch from the external plate, at its near extremity. This canula delivers cold water, at the distal extremity of the antidote, where it is poured out into its cavity, thereby keeping the hottest part of the shaft of the knife perfectly cool; consequently the balance of the shaft is even cooler. By this method, while the blade of the knife is kept at red heat, its shaft is kept nearly as cold as the water which irrigates it. This canula is represented by No. 6, in plate A. It receives the water at No. 7, and delivers it at No. 8. After passing through and around the whole thermantidote, it emerges from a canula, one-half inch in length,

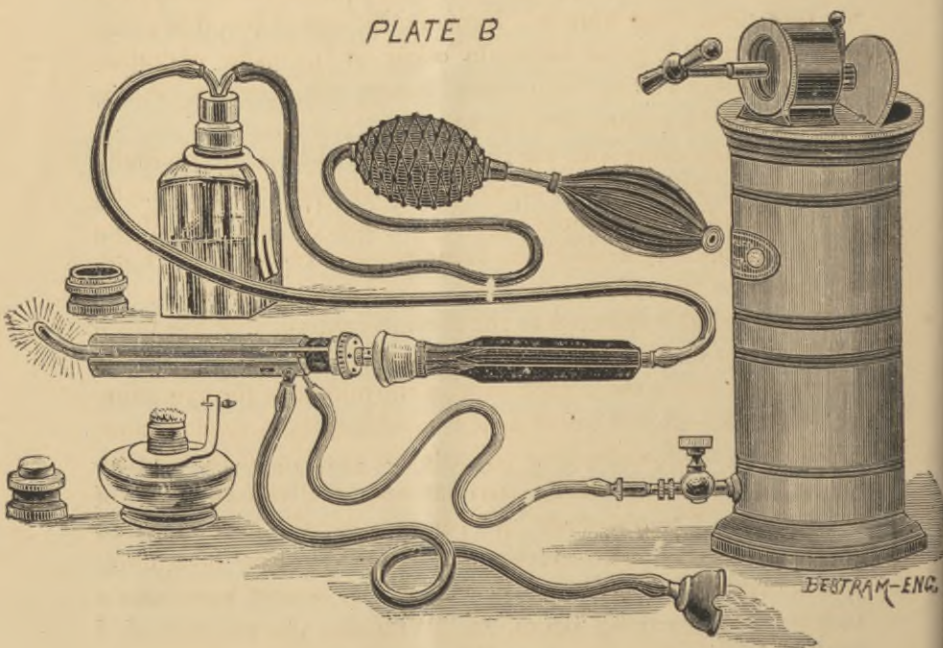
* Since reading this paper, we have improved the Thermantidote, by enlarging it, so as to make it increase the diameter of the shaft of the thermo-cauter 6 m. m.; and by placing a bridge 2 m. m. wide on its concave surface, one and a quarter inches from its distal extremity. On this bridge rests the shaft of the thermo-cautery, and allows sufficient space between the cauter and antidote, for free circulation of air. Thus we are enabled to dispense with the fenestra corresponding to the fenestra in the shaft of the knife; and what is more important, we prevent the knife from being too rapidly cooled, by too close contact, with cold water ever flowing about it.

with a perforation of one-fifth of a milli-metre, (as seen in plate A, No. 9. To this is attached a small gum tube, of sufficient length, to carry the water into a bucket under the table. A weight attached, keeps the distal end of the tube securely in the bucket.

The Thermantidote is kept constantly supplied with a current of cold water, by a gum tube attached to the canula at No. 7, in plate A, and connecting with an Eguisier's irrigator. This irrigator, when filled with water, will take twenty-five minutes to discharge its contents; and all that is necessary, in a lengthy operation, is to require an assistant to fill it up from time to time. I have kept it constantly running for two hours.

The irrigator opening, delivering the water to the Thermantidote, is one-fifth of a milli-metre in diameter, which allows the water to be discharged sufficiently fast for all cooling purposes; and not so fast as to exhaust the irrigator too rapidly. The canula opening for the same tube is two milli-metres in diameter.

PLATE B



Letter C, in Plate A, represents the thermantidote applied to the thermo-cautér. Plate B represents Eguisier's irrigator and the Thermantidote applied to Paquelin's thermo-cautery.

At an operation the irrigator sets on a small table near the foot of the operating table, and it and the connecting tubing, are not at all in the way of the operator. It should be remarked, that the Thermantidote is adapted to all the forms of cautery-knife suggested by Paquelin.

No surgical instrument has come into my hands for some time past, with which I have been more pleased, than with Paquelin's thermo cautery. Operating as I do so much, in deep and narrow cavities, where bleeding vessels are hard to discover,—hard to ligate, and unsafe and difficult of torsion, I can realize the comfort to the surgeon and the advantage to the patient, in having an instrument, with which he can cut fearlessly along without regard to vessels divided, or the amount of hemorrhage. For it must not be imagined that all operations with the thermo-cautery are bloodless. Far from it. In many, the loss of blood is great, but not nearly so great, as would occur in the same operation with any other cutting instrument, except the *écraseur*, (if this can be called a cutting instrument).

In my operations with the thermo cautér, I have never found it necessary to stop to tie arteries, or check hemorrhage; but by cutting steadily on, without regard to blood, to the end of the operation, all hemorrhage was found to have ceased, without any necessity for hæmostatics.

I have heard it objected to the thermo-cautery, that too much blood is lost in some operations. This will be so if the operator attempts to arrest the hemorrhage in the middle of the operation. To illustrate.—A few weeks ago, I was removing a cystic tumor, with dense, thick walls, from the anterior portion of the vagina. A large portion of its walls were incorporated with the walls of the vagina. The old mode of operating, would have required careful dissection, with much hemorrhage, ligation of arteries, and accurately tamponning the vagina. It would have been a tedious and worrying operation. With the thermo-cautery, I removed it in a few minutes. When in the middle of the opera-

tion, a large artery sprang, and in a moment, the vagina was deluged with blood; but the next cut went entirely through the artery, compelling it to shut up, and there was no more bleeding. A little glycerine and sub-sulphate of iron, was applied as an antiseptic, and the operation was completed with a glycerole of cotton in the vagina.

Again.—A few days since, I was removing the neck of the uterus for epithelioma. The patient had had terrific hemorrhages before she was brought to me from a neighboring city; where she had been treated for months, with topical applications, for "ulceration of the womb." The intra-vaginal portion of the cervix was so short, that it would have been impossible to operate with the *écraseur*, with any prospect of benefit to the patient. There was little within the vagina that the *écraseur* could cut away; and the malignant interstitial deposit extended well up the cervix, above the vaginal junction. To this case the thermo-cautery was peculiarly applicable. As, with my small bull-dog forceps, firmly fixed in the cervix, I swung the neck about, in sweeping my knife around its circumference, in the act of amputation; the hemorrhage was profuse, and did not cease till the neck below the vaginal junction was completely severed, and the neck above the vagina was peeled out, as the core from an apple. All bleeding had stopped at the end of the operation, and the stump was dressed with a pledget of cotton, soaked in sub-sulphate of iron and glycerine as an antiseptic.

Profuse hemorrhage then will occur in some operations with this instrument; especially in cases of malignant disease. The hotter the knife, the greater the hemorrhage; and even with the knife at a dull red heat, we cannot always escape it; but in all my operations, by cutting steadily on, without regard to blood, the hemorrhage had ceased at the close of the operation. I have never had secondary hemorrhage to follow the use of the thermo-cautery.

The chief objection to Paquelin's instrument in gynecological surgery, when operating in deep, narrow passages (as the vagina),

is, that the shaft of the knife burns the parts, up to, and adjacent to the point to be operated on.

In my earlier operations, my patients had an hundred fold more pain from the burns about the vulva and lower vagina, than from the seat of operation. I observed that burns high up the vagina, gave very little trouble to me, or discomfort to the patient; while those about the vulva, were a source of great distress for weeks after. This exemption from pain in burns in the upper part of the vagina, is no doubt chiefly due to the exclusion of air; while the parts below, are subjected to atmospheric irritation, and the irritant effect of urine, dribbling over the parts, in the act of micturition.

These evil effects of heat have been entirely counteracted by the Thermantidote. The hot shaft of the cautèr, is so thoroughly protected by this instrument, that any amount of pressure can be made on the soft parts for any length of time, without the slightest injury to them. The red hot blade can be drawn within the Thermantidote, and just as much thrust out, where and when, as desired.

It may be remarked here, that the gynecologist cannot well separate the diseases of the rectum from those of the uterus and vagina. Whatever affects one of these localities, is sure to have more or less effect upon the others; and hence, in my every day-life, I have had much to do with diseases of the rectum. My experience teaches me, that what has been said of the thermo-cautery in the surgery of the vagina and uterus, may be said with equal propriety in the surgery of the rectum.

During many years, my operation for hemorrhoids was, to transfix the base of the tumor with a needle and double ligature; tie on either side; cut off the tumor with scissors close up to the ligature, and touch the stump with subsulphate of iron. I never had septicæmia to follow. My patients all got well; but the suffering for days afterwards, was always great, and sometimes intense, even with the liberal use of opium. Now, I always operate with the thermo-cautery. The lower end of the rectum is turned inside out, by passing my finger into the vagina, and pressing downwards and backwards against its posterior wall; the

hemorrhoids are successively grasped at their base with a clamp; the tumor is peeled off, by running the thermo-cautèr along the upper surface of the clamp; the stump is touched with subsulphate of iron; and the clamp is then removed. The patient experiences very little inconvenience afterwards.

In some cases of fistula in ano, the thermo-cautèr is preferable to the bistoury; as in a case which was brought to me for an operation, a few weeks since. Here the external opening was about one inch from the anus, and the internal opening unusually high up the rectum, and over the fistulous tract, there was an immense hemorrhoid, which there was no way of avoiding in dividing the fistula. My grooved director was passed from the external to the internal opening, and along this director, the thermo-cautèr cut every thing in its way. Had I used a bistoury instead of the cautery, I might have had troublesome hemorrhage from division of the hemorrhoid, whereas there was no loss of blood. In removing polypi of the rectum, the thermo-cautery will be found to be the best instrument.

The thermo-cautèr protected by the Thermantidote, will be found to be invaluable in much of the surgery of the abdominal cavity. Thus in gastro-elytrotomy, when the surgeon has reached that point where it is necessary to make an opening into the vagina, preparatory to tearing the same sufficiently for delivery of the child. Here the cautèr, when heated, can be drawn within the antidote, and the end of a cool instrument being placed on the point to be divided, the hot knife is thrust forward and through the vagina, without injury to the surrounding parts and without any loss of blood. With the aid of the Thermantidote in such a case, there is no necessity, as suggested by Dr. Garrigues in his most able paper, of protecting the surrounding parts with wet compresses."

Again, in ovariectomy, where we have a very short and thick pedicle; I would condense the pedicle with a clamp for a few minutes, and then dividing it with the thermo-cautèr, and touching the stump with subsulphate of iron, I would remove the clamp and return it to the pelvis.

Or in the same operation, where there are firm and vascular

adhesions, it would be better in many cases, to divide them with the cautèr, than to tear as is now done; and where persistent hemorrhage occurs at any point, in the separation of such tumors from their attachments; the application of the thermo-cautery to these surfaces will be found to be of great value.

The Thermantidote judiciously manipulated over the Thermo-cautèr, will enable the surgeon to pass the instrument deep down into the pelvic and abdominal cavities, without damage to the surrounding viscera.

What has been said for this instrument in operations within the vagina, rectum, pelvis and abdomen, may be said with equal truth for the mouth and throat.

From considerable experience with Paquelin's thermo-cautery, I may be pardoned for making some suggestions, and giving some cautions in its use.

1st. The benzine bottle should never be more than two-thirds full. If too full, the slightest tilt of the bottle would cause the benzine to flow down the tube attached to the cautèr; and patient, operator, and assistants might be set on fire. Or a little extra air forced into the bottle, when too full, might lift the benzine into the tube by atmospheric pressure, and cause the same accident.

2d. The benzine bottle should never be hung to the operator's clothing, or placed in his pocket. If so attached to his person, he, in the act of bending forward, might tilt the bottle, so as to cause a like accident, although very little benzine was in use.

3d. The benzine bottle should be held *securely*, in the left hand of a trained assistant, and the rubber bag for heating the knife, in the right hand of the same assistant. This assistant, under no circumstances, should be allowed to leave his post for any other work. His only duty is, to take care of the benzine, and watch closely the point of the knife, so as to keep it at the proper temperature.

4th. The blade of the knife, should never be heated too hot. A dull red heat is best, and this redness should never extend above one-third the blade.

5th. If the knife is too hot, we cut no better, lose more blood, and are in danger of bending and injuring the blade; and of

burning up the platinum gauze within the blade, thus rendering the knife worthless. This latter accident has once happened to me.

6th. When we are done using a knife, it should be heated a little extra hot, and while so, quickly separated from the wooden handle. By doing so, no carbon deposit will take place in the knife, and it will be in perfect order for future use.

7th. Because of the injudicious heating of the knife, and destruction of the platinum gauze, or clogging of the same with carbonaceous deposit, we are sometimes unable to heat the knife to the operating point. This is very embarrassing, and can be avoided by a little care on the part of the assistant.

8th. Every case of Paquelin's Thermo-cautery should contain a small metallic brush, with which to cleanse the blade of all burning tissue which adheres to it, with each incision. This clogging of the blade impedes its proper heating. The duty of an assistant is to remove such tissue as it accumulates.

9th. In all operations with the thermo-cautery, within the vagina, four assistants are essential; one to give chloroform; one to work the cautery; one to hand instruments and hold the knife, when the operator desires to be relieved of it, and a fourth to hold Sim's speculum—the only one fit for use in all uterine surgery.

