

Aug. 21, 1934.

F. C. WAPPLER

1,971,024

INSTRUMENT FOR ELECTROSURGICAL RESECTION

Filed Jan. 25, 1932

2 Sheets-Sheet 1

Fig. 1

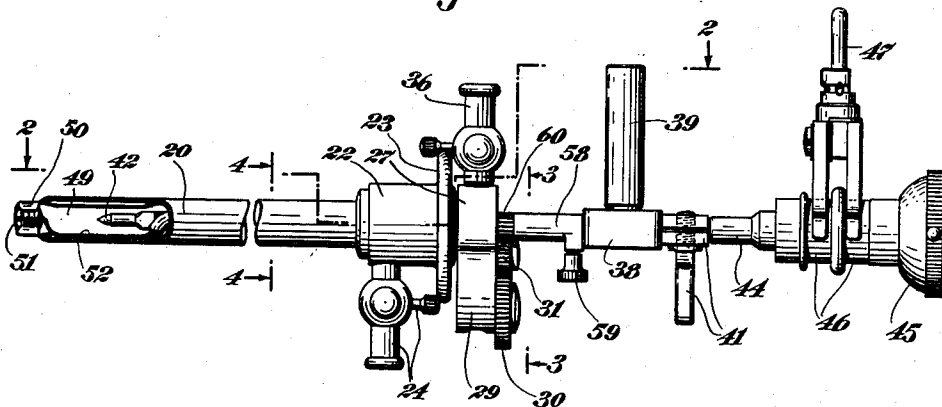


Fig. 2

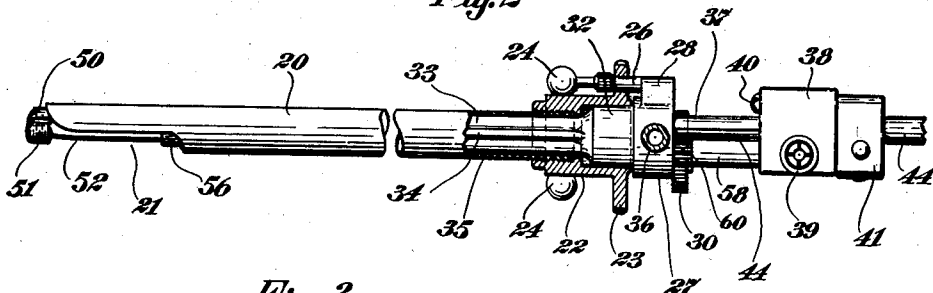


Fig. 3

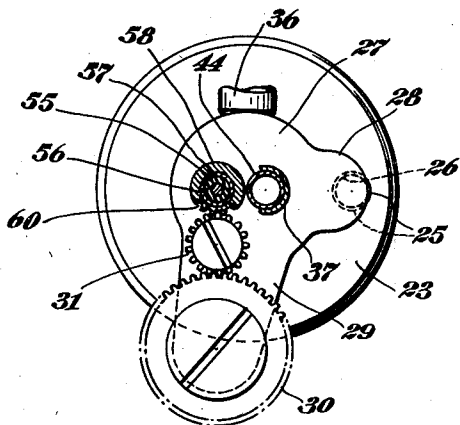
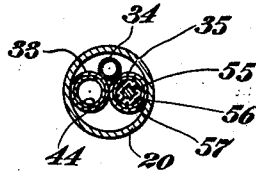


Fig. 4



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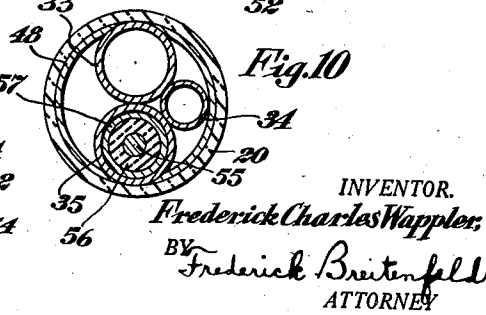
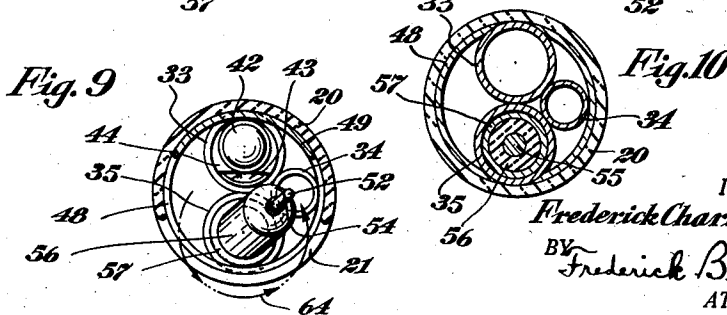
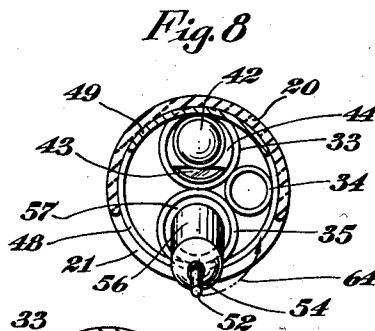
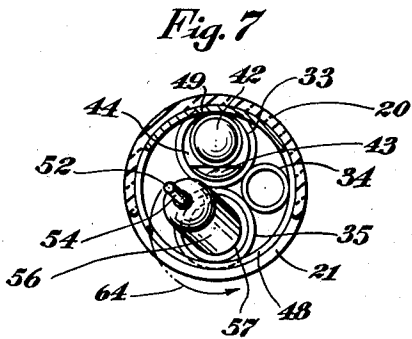
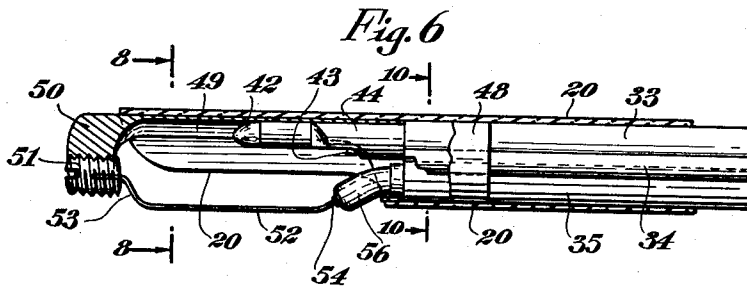
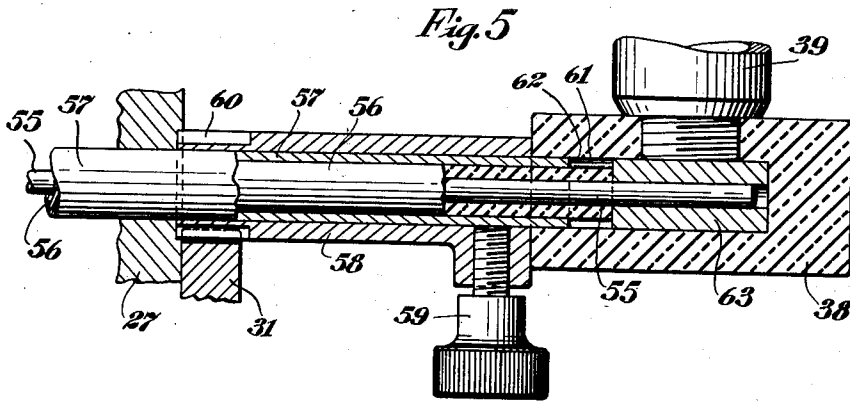
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INSTRUMENT FOR ELECTROSURGICAL RESECTION

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

1,971,024

INSTRUMENT FOR ELECTROSURGICAL
RESECTION

Frederick Charles Wappler, New York, N. Y.

Application January 25, 1932, Serial No. 588,602

9 Claims. (Cl. 174—89)

My present invention relates generally to surgery, and has particular reference to a surgical endoscopic instrument of unique characteristics and capabilities.

5 My invention is directed primarily toward the alleviation of ailments due to protrusions, such as tumor masses or the like, in body cavities. As an example of the uses to which my present instrument is particularly adapted, protrusions at 10 the deep urethra or bladder neck, caused, for example, by enlargement or ailments of the prostate gland, are typical. It will be understood, however, that my present instrument, and the several distinctive features and characteristics thereof, is capable of a wide variety of uses and 15 applications and is by no means restricted to the treatment of obstructions or the like in the urethra.

It is a general object of my invention to provide 20 an instrument by means of which internal protrusions or the like may be subjected to treatments which result in their elimination, more especially by a resection or excision accomplished by electrical means; the treatment being accom- 25 plished under illuminated vision and in a highly expeditious and simplified manner.

One of the features of my invention lies in the provision of an instrument whereby an excision may be effected in a direction substantially trans- 30 verse to the axis of the cavity in which the protrusion exists. It is a specific feature of my invention to provide an operative electrode whose construction and arrangement are such that after the protrusion, or any part thereof, has been 35 engaged, as, for example, within the fenestra of an endoscopic tube, the engaged mass may be cut or excised from the cavity wall by a transverse movement of the electrode.

One of the main objects of my present improved 40 instrument lies in the provision of means for resecting masses which are larger than those which have heretofore been capable of excision by an instrument of the same size.

A particular feature of my invention lies in an 45 arrangement whereby an operative electrode wire or the like is normally adapted to be positioned within the confines of the instrument, but is so constructed and mounted that during its movement it will be caused to emerge from the in- 50 strument.

Briefly, my invention resides in the provision of an arrangement whereby a tube having a lateral fenestra is associated with a longitudinal electrode wire normally within the confines of 55 the tube and adjacent to the fenestra, coupled

with means for sweeping the electrode wire through a transverse arc which extends out of the fenestra. The instrument is so constructed that the total sweep of the electrode wire is approximately 270°, and during its movement the 60 wire emerges from the fenestra at one lateral edge thereof and reenters the fenestra adjacent to the opposite lateral edge.

One of the features of construction whereby this desirable effect is achieved lies in the pro- 65 vision of a longitudinal spindle which is journaled in the tube along an axis which is offset with respect to the electrode wire. The spindle is mounted in spindle bearings which are arranged forwardly and rearwardly of the fenestra, re- 70 spectively, and the electrode wire is connected at its forward and rearward ends, by means of crank portions, with the spindle proper.

Another feature of construction lies in an im- 75 proved means for efficiently and conveniently effecting the desired rotation of the spindle, preferably by means of pinions or the like arranged at the rear end of the instrument.

A further feature lies in the provision of an arrangement whereby the position of the opera- 80 tive electrode wire, with respect to the tube fenestra, is constantly indicated on the exterior, and preferably, at the rear, of the instrument.

Another feature lies in the manner whereby the uninsulated, operative electrode wire is 85 adapted to be electrically connected, in an insulated manner, with an electric terminal arranged at the rear portion of the instrument, this being necessarily accomplished in a way which does not interfere with the contemplated 90 rotative movements of the spindle hereinbefore referred to.

Preferably, the spindle is constructed as a hollow member; and the electrode wire is formed 95 as an integral portion of a longitudinal conducting member which extends rearwardly through the hollow spindle and is ensheathed in insulation.

Other features of my invention lie in the asso- 100 ciation with an electrode tube of the foregoing general character of means for irrigating the area under treatment, together with means for arranging and mounting a telescope to permit a full and efficient view of the operative pro- 105 cedures.

In general, it is an object of my invention to provide an instrument which is not only simple and reliable but which is highly efficacious in fulfilling its contemplated function; to provide a compact and workmanlike mechanism capable 110

of production in a practical and commercial manner, adapted to be expeditiously constructed, assembled, adjusted, manipulated, and embodied in an efficient manner the capabilities and characteristics which my general objectives necessitate.

I achieve the foregoing objects, and such other objects as may hereinafter appear or be pointed out, in the manner illustratively exemplified in the accompanying drawings, wherein—

Figure 1 is a longitudinal view of an assembled instrument of the present character, taken from the fenestrated side of the tube;

Figure 2 is a similar view, taken substantially along the line 2—2 of Figure 1, with parts shown in section and other parts omitted for the sake of clearness;

Figure 3 is an enlarged, transverse view, taken substantially along the line 3—3 of Figure 1;

Figure 4 is an enlarged, cross-sectional view, taken substantially along the line 4—4 of Figure 1;

Figure 5 is a greatly enlarged, fragmentary, longitudinal section, taken in the same direction as Figure 1;

Figure 6 is a greatly enlarged, fragmentary, longitudinal section, taken in substantially the direction of Figure 2;

Figures 7, 8, and 9 are enlarged, cross-sectional views, taken substantially along the line 8—8 of Figure 6, and showing the operative capabilities of the present instrument; and

Figure 10 is a cross-sectional view, taken substantially along the line 10—10 of Figure 6.

The present instrument includes an outer endoscopic tube 20, preferably of insulating material such as bakelite, and provided at its forward end with a substantially lateral fenestra 21. At its rear end, this tube is attached, as by screw threads, with a collar 22 provided with the rear flange 23. The collar 22 is also provided with a petcock 24 through which an irrigating liquid may pass. The flange 23 is provided with an opening 25 adapted to receive a forwardly projecting pin 26 carried by those parts of the instrument which are to be inserted into the tube 20.

The pin 26 is mounted on a unit which is adapted to fit snugly and non-rotatively within the tube 20. This unit comprises a collar 27 adapted to abut against the rear surface of the flange 23 and provided with the lateral boss 28 which carries the pin 26, and also with the lateral boss 29 which carries the meshing pinions 30 and 31.

Forwardly of the collar 27 is a portion 32 adapted to fit snugly into the rear of the bore of the collar 22. Projecting forwardly from the portion 32 is a bundle of three tubes 33, 34, and 35. The tube 33 is adapted to accommodate a telescope presently to be described. The tube 35 is adapted to accommodate, and serves as one of the bearings of, the longitudinal spindle hereinafter to be described in greater detail. The tube 34 is somewhat smaller than the others and is an irrigation tube, communicating at its rear end with a second petcock 36 mounted upon the portion 27.

It will be understood that the portions 27 and 32 are provided with bores which communicate with the tubes 33 and 35.

Projecting rearwardly from the portion 27 is the semi-circular guide 37 which is aligned with the tube 33 and is adapted to encompass the telescope. The guide 37 connects at its rear end with the insulating block 38 which carries the electric

terminal 39. Attached to the rear of the block 38, preferably by means of a stud 40, is the clamp bearing 41 for the telescope.

The telescope which I employ is preferably of the type illustrated and described in United States Letters Patent No. 1,680,491, being provided with an illuminating lamp 42 at its forward end and an objective lens 43 which commands a forwardly oblique field of vision. The tubular body portion of the telescope is designated by the reference numeral 44 and extends longitudinally through the tube 33, through the portions 32 and 27, through the guide 37, the block 38, and the clamp 41, and terminates at its rear end with the usual eyepiece 45 and with the terminal members 46 to which suitable electrical connection may be made, as at 47, for operating the lamp 42.

The tubes 33, 34, and 35 terminate at their forward ends at substantially the same point, viz., slightly behind the fenestra 21. At this forward end, the tubes 33 and 35 are merged into integral association with a sleeve 48 which fits snugly within the confines of the outer endoscopic tube 20. This sleeve is integrally associated at its forward end with the portion 49 which lies adjacent to the wall of the tube 20, opposite the fenestra 21. The portion 49 terminates at its forward end in the enlargement 50 which carries the insulating plug or member 51 adapted to serve as the forward bearing for the rotatable electrode wire. The plug 51 is for this reason aligned with the tube 35.

The longitudinal electrode wire is designated by the reference numeral 52 and is positioned adjacent to the fenestra 21 but offset with respect to the axis of the tube 35 and of the bearing 51. At its forward end a crank portion 53 connects with the plug or bearing 51 in the manner most clearly illustrated in Figure 6. At its rear end, the wire 52 merges into a similar crank portion 54 which connects with the longitudinal conducting member 55 arranged in axial alignment with the tube 35 and extending rearwardly through the latter.

The conductive member 55 is ensheathed in the insulation 56, and the latter is enclosed within an armor or tube 57 of metal. The tube 57 is snugly yet rotatably mounted within the bearing tube 35 and extends through the latter, through the portions 32 and 27, and thence rearwardly into the block 38 in the manner most clearly illustrated in Figure 5.

Between the block 38 and the collar 27 there is arranged a rotatable sleeve 58 through which the tube 57 passes and to which it is secured by means of the set screw 59. The screw 59 and the sleeve 58 rotate along with the tube or spindle 57.

At its forward end, the sleeve 58 is provided with the teeth 60, these teeth forming a pinion which is adapted to mesh with the gear wheel or pinion 31.

One of the features of my invention lies in arranging the set screw 59 in alignment with the electrode wire 52, whereby the screw 59 will serve as a visible external indication of the position of the wire 52. In Figure 1, for example, the screw 59 is directed downwardly, and this indicates that the electrode wire 52 is also directed downwardly.

In the block 38 is a bore 61 into which the tube 57 extends; but whereas the tube 57 terminates as at 62, the insulation tube 56 extends rearwardly for a slightly greater extent, and the conductive member 55 extends rearwardly for a further extent into association with a conductive bushing

or the like 63 which is electrically connected with the electric terminal 39.

It will thus be seen that there is a continuous electrical connection between the terminal 39 and the electrode wire 52, this being accomplished through the intermediary of the longitudinal conductive member 55. When the member 55 rotates, along with the insulation 56, the tube 57, and the sleeve 58, this electrical connection remains unimpaired.

At its forward end, the insulation 56 is caused to extend for a substantial distance along the crank portion 54, as indicated in Figure 6. This is an important feature of construction because it prevents the conductive member 55 from independently rotating within the insulation tube 56. When the instrument is used, the outer endoscopic tube 20 is first inserted into the body cavity with the aid of an obturator. The telescope is then arranged in association with the unit which is to be inserted into the tube 20. (The electrode wire and its associated parts are permanently connected with this unit.) The obturator having been removed, this entire assembly is inserted forwardly through the tube 20 and is properly positioned with respect to the latter by means of the engagement of the pin 26 with the flange 23. During this insertion, the control wheel 30 is manipulated so as to position the electrode wire 52 in one or the other of its normal positions within the confines of the instrument, for example, the position of Figure 7 or that of Figure 9. The necessary electrical connections are then made, it being understood that the terminal 39 is connected with one terminal of a suitable source of high-frequency current, while the patient is either grounded or suitably connected with the other terminal of the high-frequency source. After the necessary electrical connections have been made and the desired irrigation, if any, has been effected, and after the protusion has been accommodated within the fenestra in readiness for the excision, all this being accomplished under illuminated vision by virtue of the telescope arrangement, the wheel 30 is rotated by the operator. This effects a rotation of the spindle constituted of the tube 57 and the insulation tube 56, and this rotation of the spindle causes a corresponding rotation of the conductive member 55 and of the electrode wire 52.

By virtue of my present construction and arrangement of parts, the foregoing manipulation causes the electrode wire 52 to sweep through a transverse arc which extends out of the fenestra 21. The approximate sweep of the electrode wire is indicated most clearly in Figures 7-9 by the dot-and-dash lines 64. It is to be noted that the wire sweeps through approximately 270°; that it emerges from the confines of the instrument at a point closely adjacent to one lateral edge of the fenestra 21; that it reaches its maximum emergence in the position of Figures 6 and 8; and that it reenters the instrument adjacent to the opposite lateral edge of the fenestra 21.

This sweep of the electrode wire causes a resection or excision of a mass larger than any which has been heretofore possible of accomplishment by an instrument of the same general character and size. The present instrument has been successfully employed in the excision of masses having a length of the order of an inch and a thickness of over five-sixteenths inch. These masses are removed by withdrawing the entire assembly rearwardly through the tube 20. To facilitate this withdrawal, the forward en-

largement 50 (Figure 6) is preferably cut away or concaved at its opposite sides so that no jamming will occur at the rear edge of the fenestra 21.

The procedure may be repeated with equal facility after the excised mass has been removed; and during each operation the functioning of the instrument is characterized by the remarkable rigidity of the rotating electrode wire and by the exceptionally smooth cut which it effects.

It will thus be seen that I have provided an instrument of relative simplicity; whose operative characteristics are of an efficient and desirable character; and which is reliable and highly efficacious in fulfilling its contemplated functions.

In general, it will be obvious that changes in the details herein described and illustrated for the purpose of explaining the nature of my invention may be made by those skilled in the art without departing from the spirit and scope of the invention as expressed in the appended claims. It is therefore intended that these details be interpreted as illustrative, and not in a limiting sense.

Having thus described my invention, and illustrated its use, what I claim as new and desire to secure by Letters Patent is—

1. In an instrument of the character described, a tube having a lateral fenestra, a longitudinal electrode wire normally within the confines of the tube adjacent to said fenestra, and means for sweeping said wire through a transverse arc extending out of the fenestra and beyond the confines of the tube.

2. In an instrument of the character described, a tube having a lateral fenestra, a longitudinal electrode wire normally within the confines of the tube adjacent to said fenestra, and means for sweeping said wire through a transverse arc extending out of the fenestra and beyond the confines of the tube; said means comprising a longitudinal spindle journaled in the tube along an axis offset with respect to said electrode wire, and a crank portion between said spindle and said electrode wire.

3. In an instrument of the character described, a tube having a lateral fenestra, a longitudinal electrode wire normally within the confines of the tube adjacent to said fenestra, and means for sweeping said wire through a transverse arc extending out of the fenestra and beyond the confines of the tube; said means comprising a longitudinal spindle journaled in the tube along an axis offset with respect to said electrode wire, spindle bearings arranged forwardly and rearwardly of the fenestra, respectively, and a crank portion between the rear end of said electrode wire and said spindle.

4. In an instrument of the character described, a tube having a lateral fenestra, a longitudinal electrode wire normally within the confines of the tube adjacent to said fenestra, and means for sweeping said wire through a transverse arc extending out of the fenestra and beyond the confines of the tube; said means comprising a longitudinal spindle journaled in the tube along an axis offset with respect to said electrode wire, spindle bearings arranged forwardly and rearwardly of the fenestra, respectively, a crank portion between the front end of said electrode wire and said spindle, and a crank portion between the rear end of said electrode wire and said spindle.

5. In an instrument of the character described,

a tube having a lateral fenestra, a longitudinal electrode wire normally within the confines of the tube adjacent to said fenestra, and means for sweeping said wire outwardly beyond the confines of the tube through a transverse arc which emerges from the fenestra at one lateral edge thereof and reenters the fenestra at the opposite lateral edge; said means comprising a longitudinal spindle journaled in the tube along an axis offset with respect to said electrode wire and substantially equidistant from the lateral edges of said fenestra, and a crank portion between said spindle and said electrode wire.

6. In an instrument of the character described, a tube having a lateral fenestra, a longitudinal, uninsulated electrode wire normally within the confines of the tube adjacent to said fenestra, an electric terminal at the rear of said tube, means for sweeping said wire outwardly beyond the confines of the tube through a transverse arc extending out of said fenestra; said means comprising a longitudinal, hollow spindle journaled in the tube along an axis offset with respect to said electrode wire, and a crank portion between said spindle and said electrode wire; and means extending through said spindle for establishing an insulated electrical connection between said terminal and said wire.

7. In an instrument of the character described, a tube having a lateral fenestra, a longitudinal, uninsulated electrode wire normally within the confines of the tube adjacent to said fenestra, means for sweeping said wire through a transverse arc, said means comprising a longitudinal,

hollow spindle journaled in the tube along an axis offset with respect to said electrode wire and crank-connected to the latter, an electric terminal at the rear of the tube and provided with a conductive bearing aligned with said spindle, and means extending through said spindle and journaled in said bearing for establishing an insulated electrical connection between said terminal and said wire.

8. In an instrument of the character described, a tube having a lateral fenestra, a longitudinal conductive member journaled in the tube and provided with an integral, offset electrode portion arranged to lie adjacent to said fenestra, and means for rotating said conductive member to sweep said electrode portion through a transverse arc across said fenestra; said electrode portion being so constructed and arranged as to lie normally within the confines of the tube and to sweep out of the fenestra and beyond the confines of the tube during rotation of said conductive member.

9. In an instrument of the character described, a tube having a lateral fenestra, a longitudinal member journaled in the tube and provided with an offset electrode portion arranged to lie normally within the confines of the tube adjacent to said fenestra, and means for rotating said member to sweep said electrode portion through a transverse arc, said electrode portion being so constructed and arranged that it will move through the fenestra and out of the confines of the tube during rotation of said member.

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