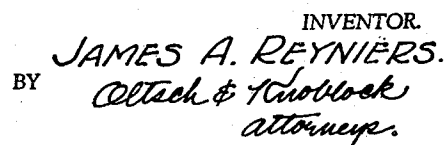


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SURGICAL OPERATING DEVICE

Filed Nov. 3, 1941

3 Sheets-Sheet 1



July 2, 1946.

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2,403,400

SURGICAL OPERATING DEVICE

Filed Nov. 3, 1941

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FIG. 4.

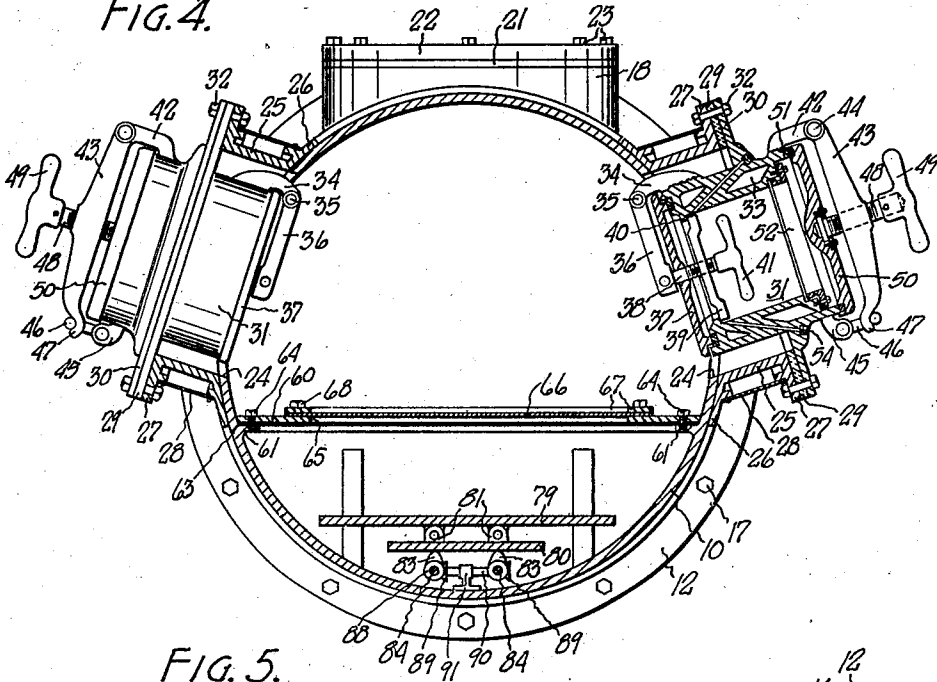
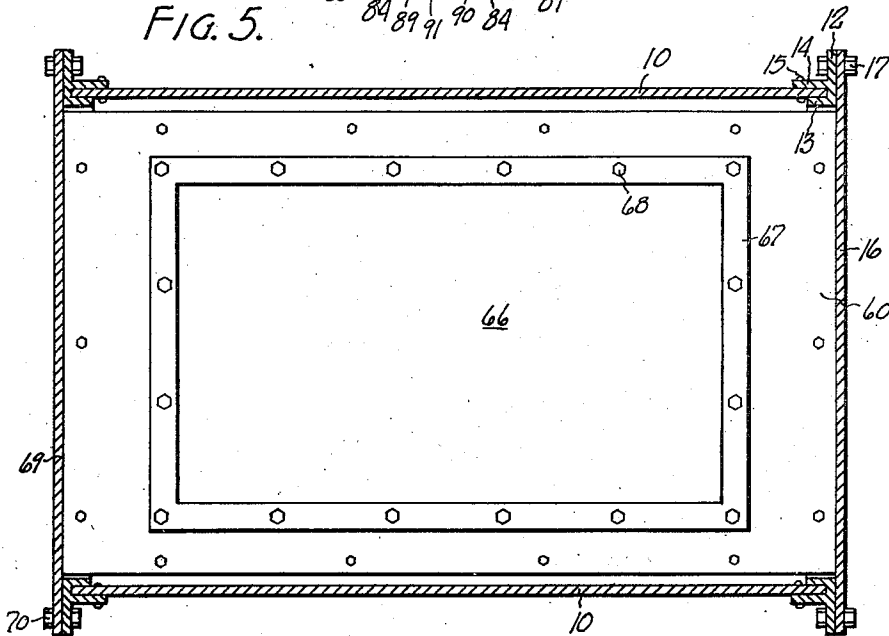


FIG. 5.



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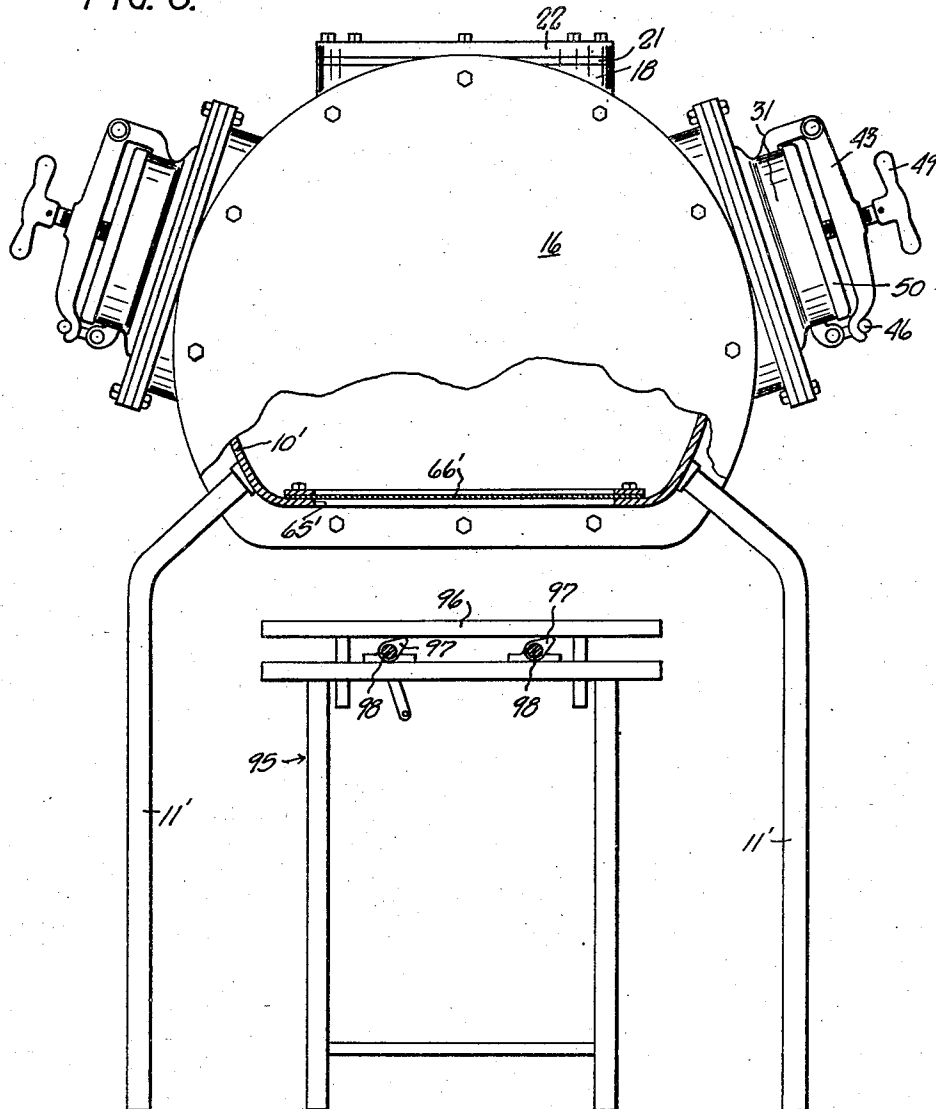
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FIG. 6.



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2,403,400

SURGICAL OPERATING DEVICE

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Application November 3, 1941, Serial No. 417,657

18 Claims. (Cl. 128—1)

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This invention relates to surgical operating devices.

Continual attempts are being made in the practice of medicine and more particularly in surgery to develop techniques, apparatus, and other means for obtaining perfect asepsis. There are always many factors which must be controlled to assure asepsis. Among them are air conditions, sterility of instruments, sterility of all surfaces contacting the patient, and particularly the incision. Thus, means such as rubber gloves, masks, and the like are now commonly used in the performance of surgical operations. Nevertheless, despite the exercise of the greatest care, infections at incisions are not infrequent, evidencing failure to completely control all vectors of infection in present methods of asepsis.

It is the primary object of my invention to provide a device by means of which more perfect asepsis may be achieved during the conduct or performance of a surgical operation.

A further object is to provide a device of this character wherein vectors of airborne infection, in addition to vectors of infection by contact, may be substantially controlled.

A further object is to provide a device of this character comprising a substantially sealed housing separated into two isolated chambers, by partition means including a portion of severable character and substantially impervious to the passage of air therethrough, one of said chambers constituting a patient receiving chamber and the other of said chambers constituting a working chamber, in which all vectors of infection are positively controlled.

A further object is to provide a device of this character including a housing in which the body portion of a patient is adapted to be placed in juxtaposition to a normally air impervious severable partition element and which is provided with an opening through which the head of a patient may project to facilitate the administration of an anesthetic to the patient.

A further object is to provide a device of this character including a patient receiving chamber defined in part by a severable lap cloth, with patient-supporting means within the chamber, and means for adjusting the position of said supporting means as selected with relation to the lap cloth.

A further object is to provide a device of this character comprising a housing divided into two compartments by a partition having a severable portion impenetrable by air, said housing having an opening at one end in communication with a patient receiving compartment through which the head of a patient may project, and having a plurality of openings in communication with the other or operating compartment which are closed respectively by a transparent closure member and

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by rubber gloves whose free ends are secured in sealed relation at the margins of the openings.

A further object is to provide a sealed operating chamber accessible by means of gloves sealing openings thereof and having a sealed sight opening, with a large opening sealed by a loosely mounted transparent flexible air-impervious lap cloth adapted to be pressed against and to adhere to the skin of a patient.

Other objects will be apparent from the description, drawings, and appended claims.

In the drawings:

Fig. 1 is a side view of the device with parts broken away.

Fig. 2 is an end view of the device.

Fig. 3 is a longitudinal vertical sectional view of the device taken on line 3—3 of Fig. 2.

Fig. 4 is a vertical transverse sectional view of the device taken on line 4—4 of Fig. 3.

Fig. 5 is a longitudinal horizontal sectional view of the device taken on line 5—5 of Fig. 1.

Fig. 6 is an end view of a modified embodiment of the invention, with parts broken away.

Referring to the drawings, which illustrate the preferred embodiment of the invention, numeral

10 designates a housing preferably cylindrical in shape and formed from sheet metal. Housing 10 is supported upon legs 11. At each end of the cylindrical housing 10 is provided a flange member best illustrated in Figs. 3 and 5. This flange member comprises a flat annular portion 12 having an outer diameter substantially greater than the diameter of housing 10, and an inner diameter slightly less than the inner diameter of housing 10. A pair of concentric flanges 13 and 14 project from one face of flange 12. The spacing between flanges 13 and 14 is preferably substantially equal to the thickness of the material of which housing 10 is formed, so that the ends of said housing may be received within the annular cavity defined by said flanges 13 and 14. The large diameter flange 14 is preferably wider than the small diameter flange 13 and rivets or other suitable securing means 15 may be driven through the outer flange 14 and the wall of housing 10. If desired, a sealing gasket of any suitable form and character (not shown) may be employed to seal the joint between the housing 10 and the flange unit. One end of the housing 10 is closed by an end plate 16 which is of a diameter substantially equal to the outer diameter of flange 12 and which may be secured to the flange 12 by securing means 17, such as bolts and nuts. An annular gasket (not shown) may be interposed between the margin of plate 16 and the flange 12 in a position inwardly of the securing means 17.

The housing 10 is provided with a plurality of openings therein of which one at the center of the top is spanned by a vertical tubular por-

tion 18 secured to housing 10 by means of a flange 19 conforming to the contour of housing 10 and secured thereto as by rivets 20. A transparent closure 21 spans the outer end of tubular portion 18 and a ring 22 overlies the margin of transparent member 21 to secure the same on the tube 18, as by means of bolts 23. The transparent member 21 provides means by which the interior of the housing 10 may be fully viewed and inspected. A plurality of apertures 24 are formed in the housing 10, said apertures preferably being four in number arranged in pairs at opposite sides of the housing and preferably at and above the center thereof. Each pair of apertures 24 is arranged and spaced in the housing to permit convenient insertion of the arms of a surgeon therethrough while the surgeon views the interior of the housing through the transparent closure 21. Cylindrical members 25 whose inner edges are curved to conform to the contour of the housing 10, and from which projecting flanges 26, are secured to the housing 10 register with each of the openings 24. The outer edge of cylinder 25 lies in a plane and outwardly projecting flange 27 lies in said plane. If so desired, an annular closure member 28 may extend between the flanges 26 and 27 in spaced relation to the cylinder 25 to provide a water jacket around the cylinder 25. A gasket ring 29 bears upon the outer face of the flange 27 and an annular flange 30 projecting from a glove clave 31 bears upon the gasket 29 and is secured to the flange 27 by securing means 32 such as bolts passed through said flanges and gaskets.

Glove clave 31 comprising a cylindrical body portion preferably having its walls chambered annularly at 33 to provide a water jacket therearound. An arm 34 projects from the chamber 31 and has pivoted at 35 to its outer end in inwardly spaced relation to the end of glove clave 31, a link 36 positioned to extend radially relative to the glove clave. A closure 37 for the inner end of the clave 31 is mounted upon a shaft 38 and carried by the free end of link 36. A cross piece 39 is free to slide upon the shaft 38 with its ends bearing against abutments 40 projecting into the clave at the inner end thereof. A hand grip member 41 is threaded upon the end of shaft 38 and is adapted to bear upon the cross bar 39 for the purpose of drawing inwardly upon the shaft 38 and the closure member 37 to effect a sealed engagement between the margin of the closure 37 and a suitable gasket mounted upon the inner end of the clave.

An arm 42 is mounted rigidly upon the outer end of the clave 31, and projects longitudinally outwardly thereof. A cross bar 43 is pivoted to the outer end of the arm 42 at 44 and is adapted to extend diametrically of the end of the clave 31. An arm 45 projects outwardly from the clave 31 in diametrically opposed relation to arm 42 and pivotally mounts a latch member 46 having a portion adapted to seat against a hooked end portion 47 of cross bar 43. A shaft 48 is threaded centrally through cross bar 43 and mounts a hand piece 49 at its outer end. A closure plate 50 is rotatably mounted on the inner end of shaft 48 and adapted to be pressed marginally against a reduced thickness neck portion 51 at the outer end of glove clave 31 to seal the outer end of said glove clave. It will be understood that a gasket may be interposed between the glove clave and each of the closures 37 and 50 thereof to effect a seal.

The outer end of the wall of glove clave 31 is preferably of stepped formation adapted to receive an annular retainer 52 which may be secured thereto in any suitable manner and which provides means for clamping the margin of the free end of an elongated rubber glove 53 at the outer end of the glove clave. The walls of the clave may be provided with passages 54 adapted for connection with a steam line or the like whereby steam may be supplied to the interior of the housing 10 and to the inner surfaces of glove 53 for the purpose of sterilizing the interior of the device including the interior surfaces of the gloves 53 and of all parts of the device.

It will be observed from the above that access to the interior of the device may be had through the gloves 53 without danger of contact of the operator or surgeon with any item or thing within the device. Thus, assuming that the device has been sterilized by steam introduced through the openings 54 after the gloves 53 have been clamped in sealed relation to the device and the entire device is sterile, access to the device may be had by releasing the closure 50 by manipulation of hand piece 49 and shaft 48 whereupon the operator may insert his hands and arms into the gloves in the event the inner closure 37 is open. If the inner closure 37 is closed, the operator may manipulate the hand piece 41 through the gloves 53 to release the same and permit it to be opened. It will be understood that suitable means (not shown) may be provided to hold the inner closure 37 open in a manner not to interfere with the manipulation of the arms within the gloves 53 and also in a position which does not obstruct the vision of the operator through the sight opening 18-21. Should it become necessary to replace one or more of the gloves due to breakage thereof, this can be accomplished without substantially destroying the sealed and infection-free condition of the device by withdrawing the gloves into the clave and sealing the inner closure 37, thence removing the gloves 53 and replacing the same with gloves which have been sterilized through the medium of a liquid or other sterilizing medium. Thereupon, use of the device may be continued by again opening the closure 37. The water jacket 33 of the clave and that defined by the cylinder 25, flanges 26 and 27, and cylinder 28, serve as means to cool the glove clave after the introduction of steam and their provision and use is purely optional.

At a level below the lowermost portions of the openings 24 in the sides of the housing 10 is mounted a partition member 60. The longitudinal side walls of the housing 10 may be provided with inwardly projecting flanges 61 upon which the opposite sides of the partition 60 are supported and the end wall 16 may be provided with a like flange 62 to support one end of partition 60. Suitable strip gasket material 63 may be interposed between the flanges 61 and 62 and the partition 60, and bolts or other suitable securing means 64 may be utilized to facilitate securing the partition member 60 in place. Also, it may be desirable to provide the end of the partition 60 adjacent the end walls 16 with a support 64' bearing upon the bottom of the housing 10 to facilitate insertion of the partition into the housing and its removal therefrom in proper relation. Partition 60 is provided with a large opening 65 therein which is spanned by a lap cloth 66. A clamping frame 67 may be applied to the margin of the lap cloth 66 and bolts 68

may be utilized to secure the parts in clamping relation whereby the margin of the lap cloth has a sealed connection with the partition. The lap cloth 66 is preferably formed of a transparent severable material, such as Cellophane. Another important property which the lap cloth 66 must possess is imperviousness to penetration of air therethrough. Flexibility is another important property which the lap cloth may possess. It will be observed that Cellophane possess all of these properties and that other materials such as a thin sheet of rubber or rubberized fabric may also be used. In some instances, suitable means to reinforce the lap cloth may be desired. Thus, it may be desirable to use in connection with either the sheet rubber or the Cellophane a margin of fabric material or metal or the like. It is preferable that such reinforcing material be confined to the margin and that it does not extend over the main portion of the body of the lap cloth.

The end of the housing 10 opposite that mounting closure 16 is preferably provided with an upper end plate 69 which spans the major upper portion of said end opening and is secured by bolts 70 to the flange 12. End plate 67 preferably terminates slightly below the partition 60 and is provided with an inset downwardly projecting lower vertical flange 71 whose outer face is preferably flush with the inner face of the main body of the end plate 69. This off set flange 71 provides a shoulder in the plane of the flanges 61 on the housing whereby it may support the front edge of the partition 60 in sealed relation. The gasket 63 may extend between this shoulder and the front end of the plate 60. A second end closure plate 72 is adapted to close the remainder of the end of the housing 10 below the plate 69. Plate 72 is marginally secured to the end flange 12 by bolts 73 and to the flange 71 of end plate 69 by bolts 74. Plate 72 preferably has a neck opening 75 formed centrally therein and partially spanned by an apertured neck sheet 76 formed of rubber or like material, which is detachably clamped at its margin by a clamping ring 77 detachably held to place by a screw 78. Opening 75 is preferably of a size sufficient to be passed over the head of a patient and the neck sheet 76 has an opening therein of a size to fit snugly about the neck of a patient. It will be understood that the sheet 76 is of such resilience that it may be stretched sufficiently to be passed over the head of a patient.

Within the chamber formed in the housing 10 below the partition 60 is positioned an operating table 79 extending substantially the full length of said chamber. A supporting plate 80 is secured in spaced relation below operating table 79 by members 81. Supporting plate 80 rests upon a plurality of longitudinally and transversely spaced cam members 83 eccentrically mounted upon rotatable shafts 84 journaled in the device by bearing blocks 85 at least at one end. One end of one of the shafts 84 projects rotatably through the plate 64 and the outer end closure 16 of the device at 86 and terminates in a crank 87 positioned exteriorly of the device. A beveled gear 88 is mounted upon each of the shafts 84 and meshes with a bevel gear 89 mounted at each end of shaft 90 extending transversely and between the shafts 84 and supported in suitable bearings 91.

It will be observed from the above that a patient may be placed in the lower chamber of the device when the plate 72 is removed and plate 72

may be then applied by passing the head of the patient through the opening 77 therein. The neck sheet 76 may then be applied over the head of the patient and the clamping ring 77 may be employed to secure the neck sheet 76 to the end plate 72. It will be assumed that the operating table 79 will be in its lowermost position when the patient is placed thereon, and thereupon the crank 87 will be actuated to elevate the operating table 79 to a position wherein the patient is placed against the lap cloth 66. Lap cloth 66 is preferably loosely mounted upon the partition 60 and when formed of Cellophane or the like in the nature of synthetic plastic material may be moistened and pressed against the patient in the area in which the incision is to be made. Cellophane when moistened has the property of adhering to contoured surfaces against which it is pressed and tends to assume the contour in which it is pressed. The looseness of the lap cloth 66 should be sufficient to permit the Cellophane to be pressed against the abdomen or other part of the patient at which the incision is to be made, to adhere thereto. The operation may then be performed, by severing the lap cloth or cutting away a portion thereof to expose the local area only of the skin of the patient at which the incision is to be made, and the adhesion of the Cellophane around that area will tend to effectively maintain an air-tight seal. The operation is performed by the surgeon who inserts his hand into the upper operating chamber through the gloves 53 and who views the patient and the incision through the transparent closure 21. Cellophane is particularly well adapted for this purpose because it is substantially transparent and consequently the surgeon can see the patient there-through and thus accurately proceed with the incision. Of course, it will be understood that after the Cellophane has been cut away at the vital area, the view of the surgeon is not impeded by the Cellophane. As best illustrated in Fig. 2, the device is preferably provided with two sets of glove claws so that an assistant may have full access to the operating chamber as may be necessary.

It will be understood that the operating chamber will be provided with the equipment necessary to conduct the operation. Thus, lights (not shown) will be mounted within the operating chamber and connected with an exterior source of power by means of a conventional electric cord passing through a stuffing box or a constrictive fitting mounted within the opening of the chamber through which the cord passes. Likewise other electrical connections may be made for the use of electric cauteries or the like. Suitable supporting means in addition to the marginal portion of the partition 60 may be provided to hold the necessary instruments and equipment which the surgeon will require. It will be understood that all of this equipment must be inserted in the device through the end thereof and for this purpose the end plate 69 as well as the end plate 72 is detachably mounted upon the housing 10. By the use of steam introduced through the steam inlets 54 after the operating equipment has been introduced into the operating chamber, and after an imperforate lap cloth has been applied, the entire interior of the upper operating chamber and all contents thereof may be positively sterilized before an operation takes place. The sterile condition of the chamber is substantially retained throughout the operation by virtue of the adhesion of the Cellophane lap cloth 66 to

the skin of the patient in the area around the incision. In this connection it will be observed that Cellophane is a material of homogenous character which will stand steam without deterioration and which will be moistened by the condensation of the steam for the purpose of effecting the adhesion and the molding to effect the contour. The Cellophane is also impervious to the penetration of air, and consequently there is no possibility that air-borne vectors of infection can pass into the operating chamber once that chamber has been sterilized. During the operation, the head of the patient, being positioned exteriorly of the device, is readily accessible for the administration of an anesthetic.

While the construction of the device illustrated in Figs. 1 to 5 inclusive constitutes the preferred embodiment of the device, attention is directed to the embodiment illustrated in Fig. 6, which is somewhat modified. Note that housing 10' is provided with only one chamber, and that it is provided with a large opening 65' at its bottom spanned by the lap cloth 66'. Legs 11' are so spaced and positioned that an operating table 95 may be positioned therebelow. Operating table 95 is provided with a patient supporting panel 96 thereabove which is provided with suitable means such as the cams 97 mounted upon the shafts 98 journaled to the top of the operating table by means of which said patient support 96 may be raised and lowered to bring the patient into contact with the lap cloth 66' of the operating device. In this embodiment the patient is not confined within a chamber, and the difficulty of applying and removing the end plate 72 and the neck sheet 76 is eliminated. A firm adhesion between lap cloth 66' and the skin of the patient around the incision is essential in these cases in order to assure that the sterile condition of the operating chamber will be maintained. The same advantage of accessibility of the patient for administration of anesthetics is obviously present in this modified embodiment to the same or to a greater degree as in the preferred form. In fact, this modified embodiment has the additional advantage of permitting administration of a local anesthetic through injection and the like, in addition to administration of a general anesthetic.

I claim:

1. A surgical operating device comprising a housing having a restricted opening at one end and two or more openings at its upper portion, a flexible glove marginally secured to said housing around one of said upper openings, a transparent closure sealing another upper opening, a horizontal apertured partition, a severable sheet spanning said partition opening, said partition and sheet separating said housing into a lower patient-receiving compartment communicating with said end opening and an upper operating compartment, a horizontal patient-supporting member within said lower compartment.

2. A surgical operating device comprising a housing having a restricted opening at one end and two or more openings at its upper portion, a flexible glove marginally secured to said housing around one of said upper openings, a transparent closure sealing another upper opening, a horizontal apertured partition, a severable sheet spanning said partition opening, said partition and sheet separating said housing into a lower patient-receiving compartment communicating with said end opening and an upper operating compartment, a horizontal patient-support-

ing member within said lower compartment, and means for positioning said last named member at a selected elevation within said lower compartment.

3. A surgical operating device comprising a housing having a restricted opening at one end and two or more openings at its upper portion, a flexible glove marginally secured to said housing around one of said upper openings, a transparent closure sealing another upper opening, a horizontal apertured partition, a severable sheet spanning said partition opening, said partition and sheet separating said housing into a lower patient-receiving compartment communicating with said end opening and an upper operating compartment, a horizontal patient-supporting member within said lower compartment, a shiftable support mounting said last named member, and an actuator including an operating portion terminating exteriorly of said housing for adjusting the position of said support and last named member.

4. A surgical operating device comprising a housing having a restricted opening at one end and two or more openings at its upper portion, a flexible glove marginally secured to said housing around one of said upper openings, a transparent closure sealing another upper opening, a horizontal apertured partition, a severable sheet spanning said partition opening, said partition and sheet separating said housing into a lower patient-receiving compartment communicating with said end opening and an upper operating compartment, a horizontal patient-supporting member within said lower compartment, and a closure for said end opening removably mounted on said housing and having a neck opening.

5. A surgical operating device comprising a housing having a restricted opening at one end and two or more openings at its upper portion, a flexible glove marginally secured to said housing around one of said upper openings, a transparent closure sealing another upper opening, a horizontal apertured partition, a severable sheet spanning said partition opening, said partition and sheet separating said housing into a lower patient-receiving compartment communicating with said end opening and an upper operating compartment, a horizontal patient-supporting member within said lower compartment, a closure for said end opening removably mounted on said housing and having a neck opening, and an apertured resilient sheet spanning said neck opening.

6. A surgical operating device comprising a housing having a restricted opening at one end and two or more openings at its upper portion, a flexible glove marginally secured to said housing around one of said upper openings, a transparent closure sealing another upper opening, a horizontal apertured partition, a severable sheet spanning said partition opening, said partition and sheet separating said housing into a lower patient-receiving compartment communicating with said end opening and an upper operating compartment, a horizontal patient-supporting member within said lower compartment, and means for supplying steam to said housing to sterilize said upper compartment.

7. A surgical operating device comprising a housing having a restricted opening at one end and two or more openings at its upper portion, a flexible glove marginally secured to said housing around one of said upper openings, a transparent closure sealing another upper open-

ing, a horizontal apertured partition, a severable sheet spanning said partition opening, said partition and sheet separating said housing into a lower patient-receiving compartment communicating with said end opening and an upper operating compartment, a horizontal patient-supporting member within said lower compartment, and sealing means interposed between said housing and the margin of said partition to normally isolate said compartments.

8. A surgical operating device comprising a housing having a plurality of spaced openings therein, a partition having a marginal sealed connection with said housing and dividing said housing into isolated upper and lower compartments each communicating with at least one of said openings, said partition including a longitudinal apertured portion, and a severable sheet spanning said aperture and of a material impenetrable by air.

9. A surgical operating device comprising a housing having a plurality of spaced openings therein, an apertured partition having a marginal sealed connection with said housing and dividing said housing into upper and lower compartments each communicating with at least one of said openings, a severable sheet of material impenetrable by air spanning said aperture, a patient-supporting table in said lower compartment, and means supporting said table in selected spaced relation to said sheet.

10. A surgical operating device comprising a housing, a horizontal apertured partition spanning the interior of said housing and secured thereto, means sealing the joints between said partition and housing, and a severable sheet of a material impenetrable by air, spanning said aperture and having a marginal sealed connection with said partition, said housing having spaced openings each communicating with one only of the compartments defined by said partition.

11. A surgical operating device comprising a housing having a plurality of openings and defining an operating chamber, a flexible glove sealing one opening, a transparent closure sealing another opening, a transparent sheet of flexible distensible severable material impenetrable by air and adapted to adhere to skin when wet, loosely spanning the lowermost opening, and means for marginally clamping said sheet in said opening, said chamber being sealed by said glove, closure, and sheet.

12. A surgical operating device comprising a housing having a plurality of openings and defining an operating chamber, a flexible glove sealing one opening, a transparent closure sealing another opening, a transparent sheet of flexible severable material impenetrable by air and adapted to adhere to skin when wet, loosely spanning the lowermost opening, and means for marginally clamping said sheet in said opening, said chamber being sealed by the adhesion of said sheet with skin when an adhered portion of said sheet is centrally severed, and means for supplying steam to said chamber.

13. A surgical operating device as defined in claim 11, wherein said housing has horizontal supporting surfaces adjacent to said lowermost opening and is open at one end, and an end closure is detachably mounted on said housing in sealed relation.

14. A surgical operating device comprising a housing defining an operating compartment having a plurality of spaced openings, means including a flexible glove and a transparent closure for sealing certain of said housing openings, an apertured horizontal frame member spanning another opening and having a sealed marginal connection with said housing, and a slack transparent Cellophane sheet marginally secured to and spanning said frame to define a sealed operating chamber in the upper portion of said housing.

15. A surgical operating device comprising a housing open at its bottom and having a plurality of spaced openings therein, means for sealing said openings including a transparent closure and a slack flexible glove, a flexible, transparent, severable, air-impervious sheet marginally secured to said housing to seal and span said open bottom, said sealing means and sheet defining a sealed operating chamber in said housing, an operating table positioned adjacent said sheet exteriorly of said chamber, and adjusting means for selectively spacing said sheet and table for large area contoured air-sealed contact of said sheet with the body of a patient on said table.

16. A surgical operating device comprising a housing open at its bottom and having a plurality of spaced openings therein, means for sealing said openings including a transparent closure and a slack flexible glove, a flexible, transparent, severable, air-impervious sheet adherent to skin when wet marginally secured to said housing to seal said open bottom, said sealing means and sheet defining a sealed operating chamber in said housing, an operating table spaced below said sheet exteriorly of said chamber, and means for adjusting the vertical position of said table to position a patient for adherence of a large area of said sheet with his body around the portion of the sheet to be severed.

17. A surgical operating device comprising an operating table, a sealed operating chamber spaced above said table, said chamber having a sealed sight opening, an opening sealed by a flexible access member and an opening at its bottom spanned and sealed by a slack lap sheet, said lap sheet being formed of flexible, distensible, transparent air-impervious plastic material adapted when wet to be shaped in a predetermined contour and to adhere to the body of a patient on said table to maintain said chamber sealed when said sheet is severed centrally of the adhered portion thereof.

18. A surgical operating device comprising an operating table, a sealed operating chamber spaced above said table, said chamber having a sealed sight opening an opening sealed by a flexible access member and an opening at its bottom spanned and sealed by a slack lap sheet, means for adjusting the position of one of said table and chamber units relative to the other, said lap sheet being formed of transparent, flexible, air-impervious, synthetic material adapted to adhere to a contoured surface of the body of a patient on said table when pressed thereagainst when wet whereby said chamber will remain sealed when the adhered portion of said sheet is severed.

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