

# Model Operating Room Is Feature at A Century of Progress

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**A**N IDEAL operating room: Such were the brief, yet complete and exacting instructions laid down by the Electric Light and Power Industry for this part of its exhibit at A Century of Progress.

It was not to be an ideal specialty operating room; it wasn't to be like this one or that one; it was not an ideal tempered to suit someone's pocket-book; it wasn't an ideal fitted into spaces left between pipes and columns and the floors above and below; it wasn't even to be fitted into a department; it wasn't to be an ideal compromised into mediocrity. It was merely specified that it should be an ideal operating room. Such a request would make any architect reach for his T-square.

There no doubt is much difference of opinion as to what constitutes an ideal operating room. However, since the operating room is simply the housing for surgical procedures, in the ideal one, the housing should neither be seen nor heard. The

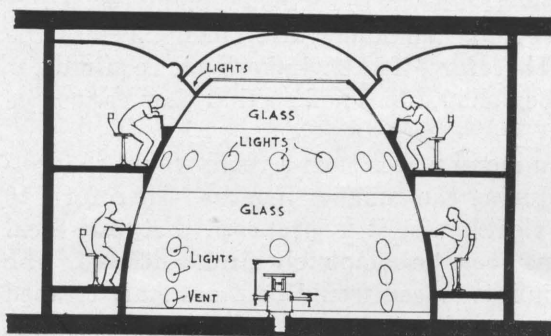
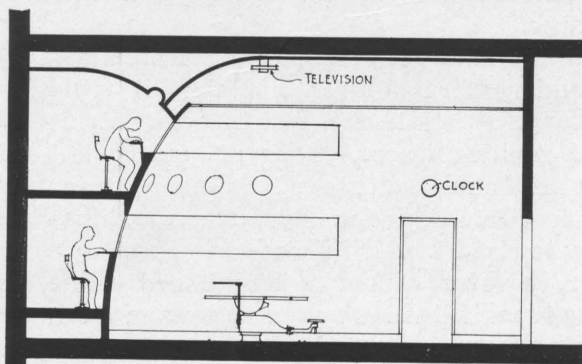
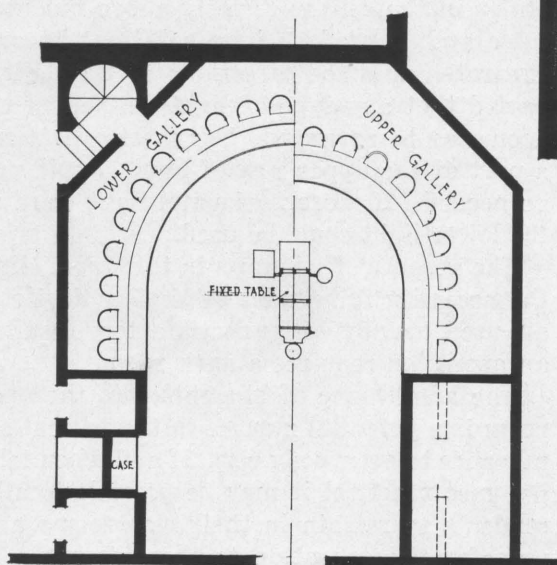
patient should be the sole concern—the surgeons, the nurses, the room, the equipment and even the architect—are only necessary incidentals.

The patient gives little thought to this place where he steals the show—where he is the focus of all eyes. If he expressed his ideas he would probably advocate the best of working conditions for the surgeons and nurses, absolute cleanliness, an attractive appearance (if he is to be ushered to the stage while still conscious), and the absence, until he is unconscious, of the terrifying “mask-raders.”

## *Must Consider the Students*

The patient's demands are modest except in that one particular about the best of working conditions for the surgeons and nurses. These would include “room enough,” perfect cleanliness, perfect lighting, every mechanical accessory close at hand, and absence of noise and confusion; in

*The left half of the drawing immediately below shows the plan of the room at the lower gallery, and the right half, at the upper gallery. The drawing at the upper right shows a longitudinal section, while at the lower right is a cross section.*



short, a work shop that allows concentration on the serious business at hand.

The ideal operating room can be found only in the hospital, and a hospital without some form of teaching is not complete. But students, whether undergraduates or interns cannot be admitted to the operating room safely. On the other hand, if they are not admitted to the operating room, and even if space is provided for them in galleries or in modern amphitheaters, they are unable to get a good view of the operating field.

#### *A Complete Air Conditioning System*

The operating room described here was designed as an ideal room that would meet all of the requirements of surgeons, nurses, students and patients. It has been installed in the Electrical Building at the exposition in Chicago. It is constructed on a reduced scale, one-quarter actual size.

The room is 18 feet wide and 24 feet long at the floor line. The front end of the model is open and represents the corridor or adjoining room wall. The back end of the room is semicircular. The dimensions permit of a "clean" area 12 feet in diameter, a 2-foot ambulatory between the wall and this area and a larger traffic way at the entrance. The area is liberal for comfortable working conditions, large enough so that there need be no danger that the scrubbed personnel and the aseptic area are invaded by the unscrubbed personnel, and yet not so large that it is a burden for cleaning and other maintenance.

Perfect cleanliness is perhaps a physical impossibility, and even if it were once obtained it would not last long. It is a known fact that the outside air in large cities, where the largest and busiest hospitals are found, is dirt laden. To ensure, so far as possible, clean air for the operating room it is necessary to clean the air by mechanical methods. Clean air, however, cannot be maintained in the operating room if there are other sources of fresh air supply, such as a window. Experience has demonstrated that a window that can be opened in a room that is supplied with conditioned air inevitably results in the window being opened at times, thereby admitting dirt laden air into the room. Therefore, if the windows are required for light, they should be fixed so that they cannot be opened.

But in many places such a room would be intolerable during the summer months. Therefore, to ensure cleanliness, it is proposed that this ideal operating room be completely air conditioned. The fresh air introduced would be thoroughly cleaned by any one of several methods that have been proved satisfactory. It would be heated in the winter and cooled in the summer to the temperatures

desired by the surgeons. At the same time, the humidity could be fixed as desired, for, with the heating and refrigerating plant, both temperature and humidity can be automatically controlled. The air conditioning plant, therefore, provides the maximum of cleanliness and at the same time adds to the comfort of both the patient and the personnel.

Just as air conditioning has eliminated the necessity for the window as a source of ventilation in the operating room, so has the electric light eliminated the window as a source of light. All surgeons have not agreed that the north light provided in practically all operating rooms is unnecessary, yet surgical nurses will confirm the statement that in spite of the large windows and skylights, the surgeons almost invariably request that the artificial light be turned on. The various forms of lighting now available produce a quantity and quality of light that is as unchanging as the pyramids. Consequently, no windows are provided in this ideal room.

The lighting system is in two parts. The indirect cove lighting in the ceiling is for general illumination. While the indirect lighting system may be used during the operation if the surgeon desires, it is intended primarily for lighting during the preparation of the room. The model does not indicate all the possibilities of the indirect lighting arrangement, but through the use of dimmers, colored lights and other attachments the patient may be ushered into a room and anesthetized under conditions that are attractive.

#### *A New Type of Students' Gallery*

The lighting for surgery consists of a row of bull's-eyes and a single powerful beam from an outlet in the ceiling directly above the operating table and focused on it. Each light is controlled separately and the directions of the light are so varied that any type of light desired by the surgeon may be arranged. For most operations only a part of the upper row of lights would probably be needed. If more horizontal light were needed, the lower light could be used.

The absence of windows in this room eliminates the necessity for shades or similar devices which are used, usually with unsatisfactory results, when an operation requires a dark room.

The admittance of students into the operating room is a potential menace to the patient and is a nuisance to everybody else. If and when television becomes practical it may be possible to allow the students to remain in their classrooms and thus transfer the operation to the classroom. Under present conditions, however, students must be at the operating room. They should be able to see



what is going on as clearly as the surgeon himself, and yet not be in the aseptic area. The surgeon must be able to talk to the students as he proceeds and the students should be able to ask questions. Viewing an operation from the usual type of amphitheater is about as satisfactory as watching a horse race through the wrong end of a field glass. If some one of the personnel around the table does not block the observer's view entirely, the things to be seen are so minute that even those who are in the front row are unable to see clearly. To eliminate the observer from the operating room yet to permit him to see and hear better than is ordinarily possible may seem paradoxical, yet that has been done in this operating room. The students are

the table, none of whom is more than ten feet from the operating table—a very unusual arrangement.

The desire to improve teaching conditions in the operating room is the reason for the unusual shape of the room. In studying the picture of this room it should be remembered that the operation has been set up so that it can be seen by those who will pass the open end of the model. Normally, of course, the operation would be turned around so that it would be visible to the students in the galleries instead of, as in this case, to those on the outside.

Perhaps if each student equipped himself with a pair of opera glasses no further improvement in visibility would be needed. But the model suggests



completely separated from the operating room in semicircular galleries. The galleries have long, low glass filled openings through which the operation may be watched. The lower gallery has seats for twenty-two students, and the upper one has eighteen seats. The upper gallery projects in front of the lower gallery, and therefore is almost as close to the operating table as the lower one. The eye of the observer in the lower gallery is nine feet and in the upper gallery it is but ten feet from the center of the operating table. For most operations, the upper gallery seats are much to be preferred because the observers are able to see over the heads of the personnel around the table and directly into the wound. Forty spectators are gathered around

another aid to vision by means of the television apparatus at the ceiling directly over the table. Television authorities say that it will not be long before television will be practical for the limited use suggested here. It is proposed that the image of the operation be projected on the end wall, considerably enlarged, so that every detail may be observed by the students. As this wall is absent in the model, the image is represented by the opening alongside of the model on which a drawing of the operation is being projected. No x-ray film display box is shown because a screen will be placed on the end wall, alongside of the television screen, to which the film will be projected.

Of course, the now familiar microphone on the

anesthesia table and the loudspeakers in the galleries explain how the students hear the remarks made in the operating room. And if desired a number of microphones in the gallery and a loudspeaker in the operating room would permit the students to ask and answer questions. The address system might be arranged so that without touching anything the surgeon could summon equipment, nurses, dictate histories and call for and receive laboratory reports. Another type of nurses' call system is suggested by the use of the photo-electric cell. To summon a nurse from without, it will only be necessary for a person in the room to pass his hand through the beam of light which would in turn actuate a nurses' call system of the usual type. The person calling the nurse need not touch anything in order to operate the call system. The photo-electric cell could also be used at the doors to the operating room so that the surgeon on entering would not need to touch the door.

#### *Table Is Fixed in Position*

During certain operations the floor of the operating room becomes covered with a web like mass of hose and wires for suction, electrical saws and knives, compressed air, cardiograph, head lamps, etc. Floor connections have been used to eliminate this mass of material on the floor, but they have hitherto been found wanting because of the inherent difficulties. Many methods of overcoming this difficulty were considered, but it was not until it was decided to fix the operating table in position that a wholly satisfactory solution was found. The operating table is constantly becoming less mobile and heavier as additional devices are added to it. But with the table fixed in position, the connections needed at the table may be brought into the base of the table, where connections may be left for any kind of outlets that may be wanted.

The fixed table also eliminates the gas tanks, for the anesthetic gases may be piped from the central gas tank room to the base of the table, and thence by short, flexible hose to the anesthesia machine. Who is there to mourn the passing of this old time sore? Since the table pedestal is securely fastened to the floor, the top may be placed in any position without danger of the table tipping over. The top may be rotated and any position may be obtained by the easily controlled electric motor.

The anesthesia table serves both as the gas machine and the anesthetist's table. When not in use, the gas machine may be lowered into the table and out of the way. There is complete automatic recording of the anesthesia, and a loudspeaker in the base of the table which, when connected to the patient, amplifies the heart beat to make it audible.

The other furniture in the room is the usual

equipment. It has been designed to suit modern manufacturing methods. The anesthetist's stool is bracketed from the operating table, as is the instrument tray. Footstools likewise could be hinged on the base. Thus all loose equipment is eliminated from the operating room. The built-in case carries all of the needed supplies, with a light controlled by a door switch. All of the furniture is finished in hard and durable satin finished chromium plate instead of in the easily damaged and soft baked-on enamel.

Many persons will say that a room such as this without outside windows and wholly dependent on artificial light and ventilation cannot be more than a pipe dream. But there are many operating rooms today where outside light is practically always excluded, particularly those for ear, nose and throat work. In 1927 we designed and built two operating rooms without windows for one of the university hospitals in Chicago. The only air conditioning for these rooms is a fresh air supply admitted through a simple unit heater. After several years' trial these rooms proved so satisfactory that an adjoining operating room that was completed twenty-five years ago and had the usual wide north window fifteen feet high and a liberal skylight has recently been converted into a dark room by painting the windows and filling in the skylight. This was done at the request of the surgeons. These rooms are without air conditioning other than a fresh air supply and yet, summer and winter, for years, they have proved to be quite satisfactory.

There may be, in exceptional localities, some value in the bactericidal effect of sunshine or light of a north window. This matter must be left to the scientists to determine. Possibly an ultraviolet ray lamp would afford an adequate substitute, if used at suitable times and in proper quantity, to sterilize the rooms completely when the patients are out of them. This method would save money by eliminating the heat loss caused by the large windows now usually provided in an operating room.

Such are the reasons that governed the planning of the operating room shown at the exposition. What there is that is new about it, is based on well established principles in successful use in other fields, and adopted in an effort to make the operating room safer for the patient, and a better place for the surgical and nursing staff to work.

The usual acknowledgments are inadequate to express appreciation to those who enthusiastically cooperated in the results achieved. Dr. Paul B. Magnuson, professor of surgery, Northwestern University, not only supervised the technical details of the operation shown but his approval of the basic principles and his helpfulness on all details were invaluable. Charles G. Beersman, supervising architect for the entire exhibit (of which the operating room is but a small portion), was never at a loss in meeting the technical difficulties of building the model and his advice on the many problems that arose was always constructive. Mr. Herzog and Mr. Schaeff of the Seaman Morris Co., Madison, Wis., designed the operating tables and other furniture, McKesson Appliance Company, the anesthesia table, G. Wallerich of V. Mueller & Co., the instruments.