In Figure 2 are given exactly dimensions best suited to my illuminator.

Figure 3 illustrates the principle of the "inverse square law." One can readily see from this drawing that the penetrating power of the light wave becomes rapidly weakened, that is, inversely as the square of the distance from the source.

Figure 4 gives a perspective view of the box, which is made of sheet tin, iron or steel, with a curved back.

Fig. 4.—Perspective view of the box.

Fig. 5.—Adapter for smaller plates.

Figure 5 shows an adapter for smaller plates, the outside dimensions of the adapter being 14 by 17 inches. The inside opening can be made for any size plate desired.

The box is being used with satisfaction at the tuberculosis clinic in Washington University Medical School.

While there are other boxes being used that have indirect lighting, I do not know of any box in use that resembles the one I have described.

CONCLUSIONS

1. The box is simple, portable, light and cheap. Any mechanic is able to construct one.
2. The perspective effect of this box depends on a proper interpretation of the physics of light waves.
3. A roentgen plate should be unevenly illuminated, just as the plate was originally produced by an uneven light.

Carleton Building.

DEVICE FOR ROENTGENOGRAPHIC LOCATION OF BULLETS AND OTHER FOREIGN BODIES IN WOUNDS

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Localization by means of roentgenography presents no difficulty in the case of a finger. Here there are distinct landmarks, and it is easy to take two pictures in planes at a right angle to each other. If we employ a ray vertical to the plate at the supposed position of the foreign body, the latter is so near the plate that no correction is required for the slight lateral displacement of its shadow if not exactly at the spot where the ray is normal. In many other situations, however, two pictures at a right angle are either impracticable or inadequate, owing to the thickness of the part, the absence of very accurate bony landmarks, and often the great distance of the foreign body from the surface. The exact depth at which the foreign body is located is the difficult problem.

The methods of localization now in use fall into two groups: (1) the McKenzie-Davidson type, and (2) a method to which no distinctive name is attached. My new device is a modification of the latter type.

DETAILS OF METHOD

Apparatus Required.—1. A piece of galvanized iron netting measuring 8 by 10 inches, with meshes one-eighth inch square, the wire being of such a thickness that there are seven meshes to the linear inch. 2. A single distinctive lead marker like a small ring. 3. A set of lead numbers. 4. Facilities for

moving the roentgen tube laterally a measured distance after the first exposure. 5. A stereoscopic plate holder for the exceptional cases in which two exposures should be made on separate plates.

Manipulation.—The distinctive lead marker is fastened to the skin at a point where it will be in contact with the center of the plate during the exposure. The position of this marker is indicated on the skin with an indelible pencil. The plate, covered by the wire netting, is laid on the table. The lead serial number is invariably placed over the lower external corner of the plate. The same number should be marked on the skin with an indelible pencil. Lead markers R and L (right and left) will be of occasional service. For the thigh or any part of the head or trunk, the anticathode is placed at a distance of 21 inches from the plate; it is displaced laterally 3 inches after the first exposure. For the forearm or leg the distance from the anticathode to the plate is 14 inches and the lateral displacement 2 inches. Each subdivision of the wire mesh (one-seventh inch) that the image of the foreign body is displaced corresponds to one-half inch distance from the plate to the foreign body when the exposures were made. If this distance is considerable, one must bear in mind the fact that the foreign body is located in a direction from one image to the corresponding position of the anticathode, not necessarily in a direction vertical to the plate. Each exposure should be of the same intensity and duration as for a single picture whether the exposures are made on the same or on separate plates.

The advantage of this method lies in the small space required for the apparatus and in the absence of any mathematical calculation.

850 Seventh Avenue.

AN ELECTRICALLY HEATED CONSTANT TEMPERATURE WATER-BATH FOR SEROLOGIC WORK *

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For serologic work a constant temperature water-bath is a necessity, and a bath heated and controlled by electricity has manifest advantages over any other kind. While there are several electric water-baths on the market, they are not entirely satisfactory, either because the size is excessive in comparison with the available working space, or because the

Fig. 1.—Water-bath with two test tube racks.

regulating and heating attachments are cumbersome and in the way. A bath made according to our specifications appears to overcome these objections. Modifications as to size, but which will still retain the more important features of the bath, may suggest themselves. The bath illustrated in Figure 1 was designed to carry two metal test tube racks, each measuring $8\frac{3}{4}$ by 4 inches and $2\frac{3}{4}$ inches in height, and each with a capacity of forty-eight tubes of the 3 by $\frac{3}{8}$ inch size, as shown in Figure 2. These racks are suspended by adjustable supports from the sides of the bath in such a way that the tubes can be submerged to any desired depth. To overcome the waste of space which is one of the features of a circular bath, this bath is made square in shape, the inside dimensions being 9 by 9 inches and 5 inches in depth. The bath is made of No. 19 sheet

* From the Nelson Morris Memorial Institute for Medical Research of the Michael Reese Hospital.

copper, the inner surface of which is tinned. Outside of this is a layer of hair encased in building paper, and this in turn is covered by transite (a mixture of asbestos and Portland cement) three-sixteenths inch thick. With this insulation there is no appreciable loss of heat from the sides or bottom of the bath. The total thickness of the wall is five-sixteenths inch.

The bath is heated by two replaceable units placed in copper tubes 1 inch in diameter at the bottom of the bath, the tubes being entirely surrounded by water. Regulation of the temperature is effected by a removable, pencil type, bimetallic thermostat, also placed in a copper tube one-half inch in diameter at the bottom of the bath between the heating units. The latter are so wound and connected that one half of each unit, controlled by a single snap switch, may be thrown out of the circuit as soon as the desired temperature is reached. The remaining half of each unit, which is entirely independent of that portion of the system for rapid heating, is controlled by the thermostat, and serves to maintain the uniform temperature desired.

The advantages of the bath described are neatness of appearance, compactness, and absence of bunglesome attachments.

Fig. 2.—Test tube rack.

A CASE OF GAS EMBOLISM

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A man, with advanced pulmonary tuberculosis of the lungs, and extensive pleuritic adhesions, was given nitrogen injections in an attempt to induce pneumothorax.

The treatment was begun at 3:15. The manometer failed to register oscillations so necessary for safety. This fact, however, was unfortunately disregarded, and from 15 to 20 c.c. of gas were allowed to flow slowly into the left thorax. In two or three minutes the patient complained of "cramp" in the right leg. He was turned over, on the supposition that the "cramp" was due to position, strain or compression. The operator's attention was then distracted for a moment, and when he again looked at the patient he noticed that the head rotated to the right, that the right arm and leg were paralyzed, and that the patient was unconscious. The eyes were turned to the right, the skin was pale, and the veins stood out prominently over the right shoulder and arm. Gas embolism was immediately recognized, and the following treatment was begun, after discontinuance of the nitrogen inflation:

A hypodermic or camphorated oil (0.2 gm. of camphor) and a hypodermic of 2 c.c. of whisky were given. Then 10 c.c. of blood were withdrawn by syringe from the right arm. Hot wet cloths were applied to the head, chest and abdomen.

The pulse was small, the blood pressure 100, and the respiration and pulse regular. There was slight cyanosis of the ears and fingers. The knee tendon reflex was active. Presently the eyes began to roll. The pupils were moderately dilated.

After forty minutes the patient was able to move his right leg and arm, and he gradually improved. In forty minutes after the onset he was able to answer questions, but he was still dazed. He did not complain of pain. Fifty minutes after the onset, he was much improved, regaining control of the right arm. At 4:10 he was smiling and laughing, but was not feeling natural, and he had slight numbness in his right arm.

The patient was put in a hospital bed for observation, and the next morning the numbness had disappeared. As he felt quite well, he went home.

This case is placed on record to illustrate the need of guidance by the manometer in the induction of pneumothorax. As the notes were dictated during the time of the accident, they are accurate as far as they go.

1206 Broadway.

Military Medicine and Surgery

THE MILITARY ORTHOPEDIC RECONSTRUCTION HOSPITAL

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In England, under the direction of Sir Robert Jones, and in Canada, through the Hospitals Commission, organized effort is being made to reclaim the crippled soldier. In Germany, a similar movement was initiated by Professor Biesalski, secretary of the Organization for the Care of Cripples and of the Orthopedists' Association. In France, a layman, the mayor of Lyons, Monsieur Herriot, laid the foundation by establishing a school for crippled soldiers. In each of the belligerent countries, the necessity for intelligent care of those crippled by the war has been appreciated, and means, more or less adequate, have been found to meet it.

I wish to emphasize the importance of what is called the orthopedic reconstruction hospital. Of the soldiers unfit for further military service—the blind, those suffering from internal diseases, the psychopathic and the crippled—the first three groups can be cared for by an extension of the existing hospitals and institutions. For the crippled soldier, however, no institution exists that can properly care for his particular need, since he not merely requires medical treatment, but must frequently be equipped with an artificial leg or a brace, instructed in its use, and shown how to earn his livelihood despite the physical disadvantage under which he labors.

The injuries which tend to cripple may be divided into six classes:

1. Amputations, of which we can unfortunately expect a large number since, despite modern conservatism in surgery, the high explosives used in the present war, all too frequently produce a type of wound that necessitates sacrifice of the limb.
2. Bone injuries, malunited and ununited fractures, and cases of chronic osteomyelitis due to sequestrums or foreign bodies embedded in the bone.
3. Joint lesions. These may be contractures, due to long continued immobilization or to injury in the neighborhood of the joint, bony ankyloses, due to extensive obstruction of the joint, or painful joints due to inequality of the articular surfaces, foreign bodies or to disease.
4. Nerve injuries, either complete division of the nerve, or embedding in scar tissue.
5. Division of the tendons.
6. Static deformities of all types.

Characteristic of these six groups is the lengthy post-operative treatment required in almost all instances. For instance, to discharge a patient with a musculospiral paralysis from a hospital immediately after the operative wound has healed is to leave the task half finished. The patient must be given effective after-treatment—massage, electricity, and the proper splint—if the operation is to result in a return of function. Or take the case of a patient whose flexor tendons in the palm have been divided by a bullet. The operation is almost certain to be a failure if adequate postoperative exercises are not carried out under the eyes of a

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