

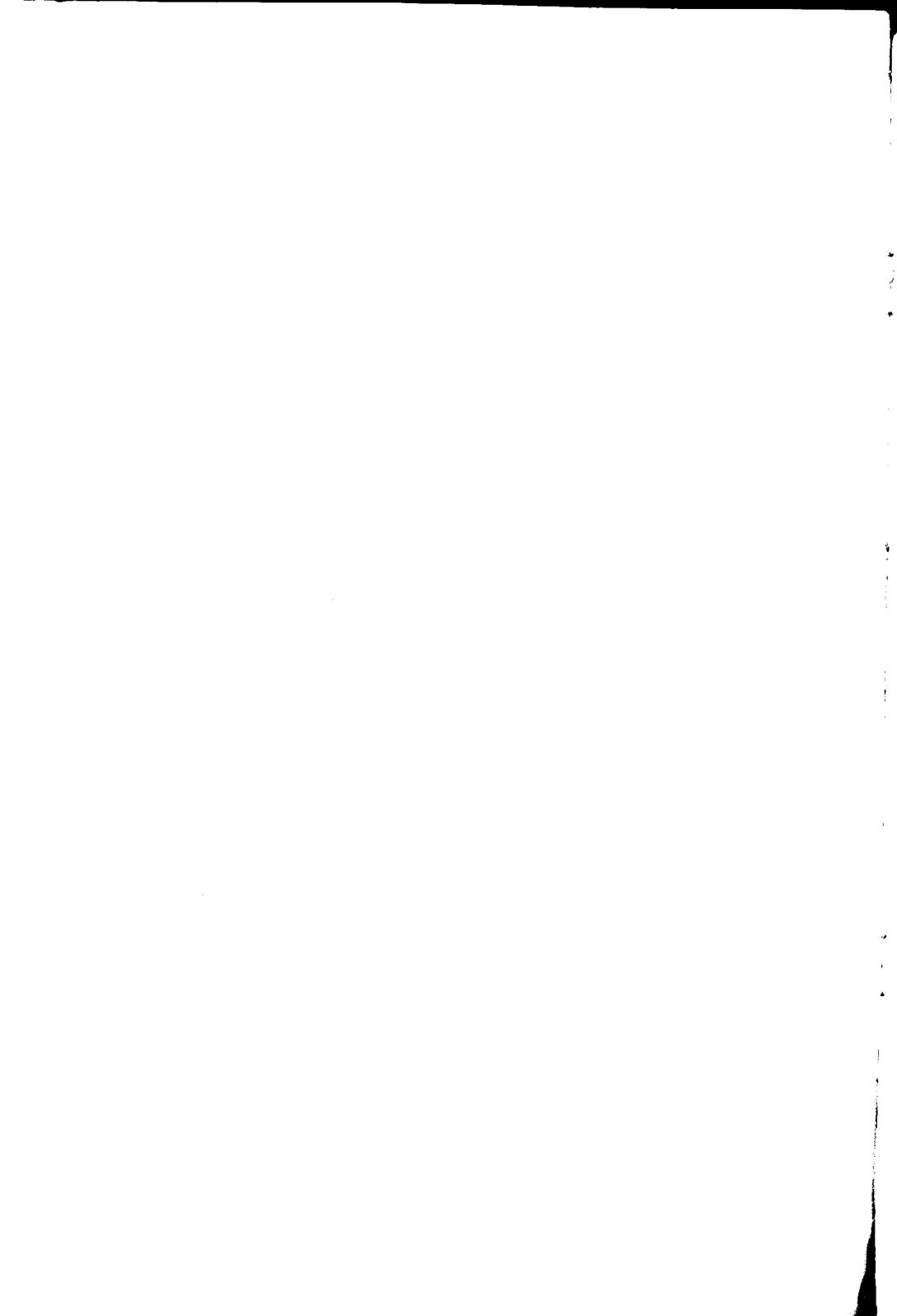
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A NEW DIAPHRAGM FOR THE COMPLETE ELIMINATION OF SECONDARY RADIATION

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THE abolition of secondary radiation has been one of the most perplexing problems confronting radiologists. The Bucky-Potter diaphragm, notwithstanding its great merits, solves only a few of the problems concerning elimination of secondary radiation. The limitations of the Bucky-Potter diaphragm are so well

known to roentgenologists that we do not even attempt to mention them.

The writer wishes to present a new diaphragm, the usefulness of which is not limited to any special technic, but which can be used for every purpose in all kinds of radiographic or radioscopic investigation, fulfilling all the desiderata of the radi-

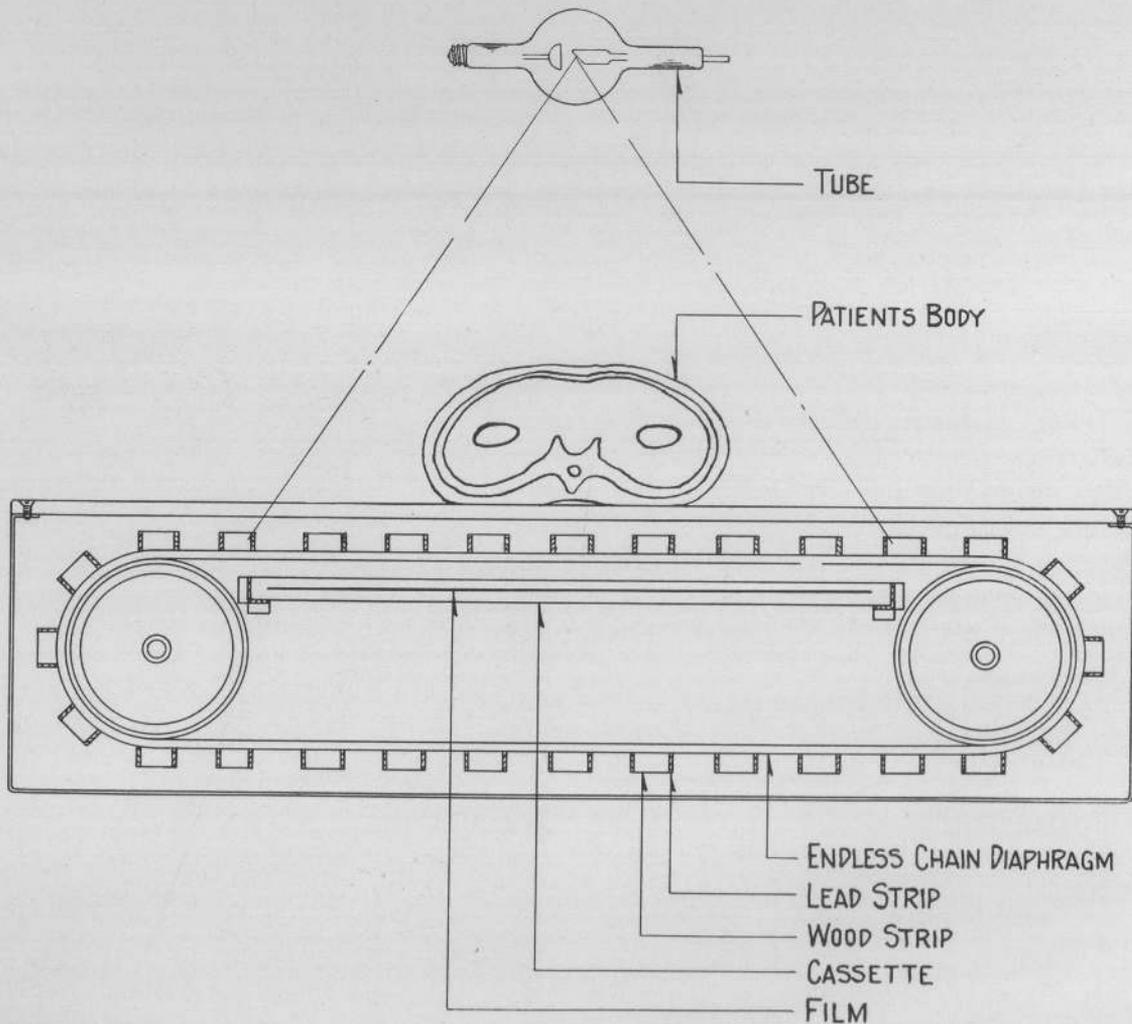
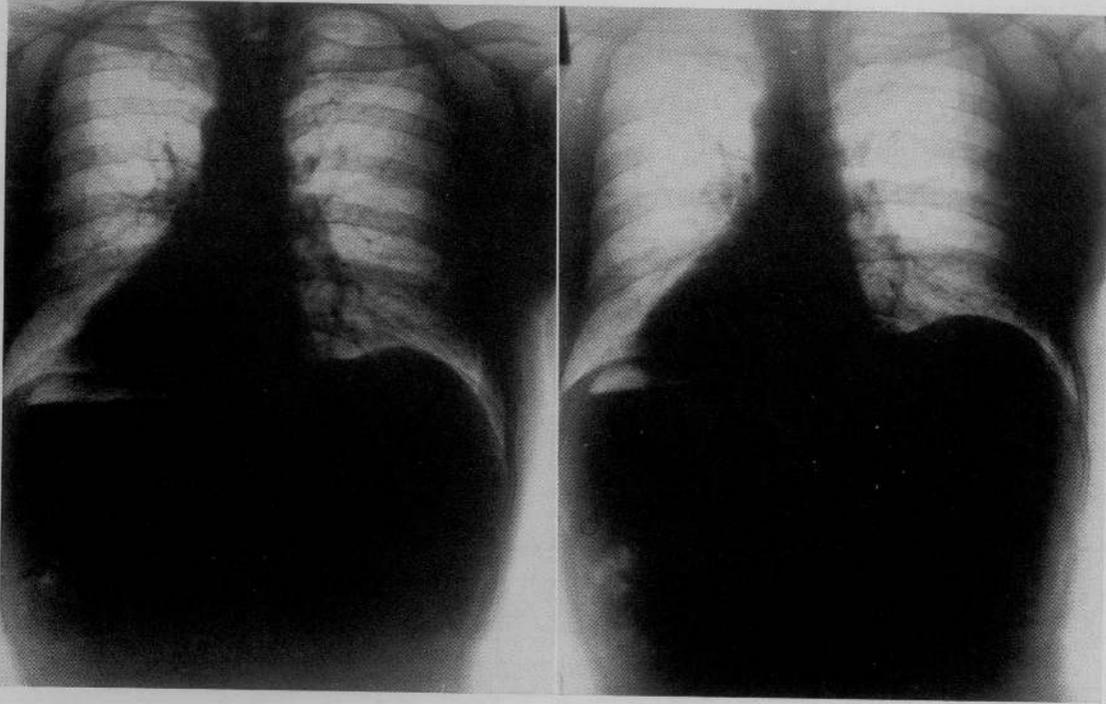


Fig. 1. Drawing of Soresi diaphragm.



Figs. 2 and 3. Chest of a heavy man. Both films were taken at 2 meters, one-tenth of a second exposure, with the same cassette. They were developed at the same time. All radiographic factors were exactly alike in these films, except that Figure 2 was taken with the Soresi diaphragm and Figure 3 without a diaphragm.

ologist. The author's diaphragm has the following characteristics:

1. It eliminates effectively secondary radiation.
2. It does not increase the time of exposure.
3. It can be used at any focal distance.
4. It allows the taking of radiographs at any speed with a sharpness of detail hitherto unknown.
5. It does not leave grid marks on any part of the film.
6. It is used also for fluoroscopy, making this procedure more useful by clearing considerably the image on the fluorescent screen.
7. It works independently from the X-ray tube.
8. It makes soft tissues very clear and distinct.
9. It works in any position.



Fig. 4. Radiograph of a young woman, 27 years of age, with goiter; normal trachea.



Fig. 5. Carcinoma of larynx, extending to trachea. Note infiltration of tissues revealed by the X-rays. Distance, 72 inches; time, one-tenth of a second.

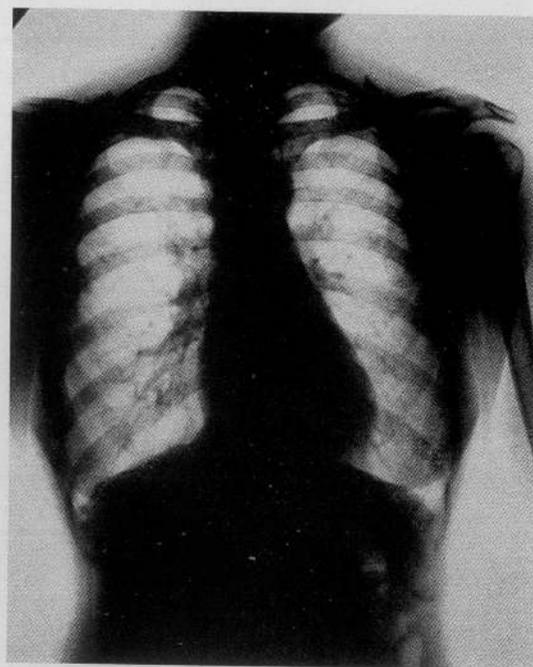


Fig. 6. Chest, at 72 inches; exposure, one-tenth of a second.

10. It can be used for all kinds of radiographic or fluoroscopic work.

We shall not enter into details of construction, which may vary with further experience and the requirements of manufacturing.

The fundamental principles on which our diaphragm is based are: (1) the lead strips are not parallel to the rays emitted by the tube; (2) the lead strips move at a tremendous speed independently of the X-ray tube; (3) the high speed at which the diaphragm moves is made possible by arranging the lead strips on an endless chain put in motion by a suitable electric motor. Physicists and radiologists may look upon these claims with skepticism. In fact, in discussing the conception of this diaphragm with leading men, nothing but the words "impossible," "contrary to physical principles," *et similia* were heard. However, skepticism was turned to praise, at times

even above merits, when the diaphragm was demonstrated in actual radiography and radioscopy.

The writer's diaphragm works with absolute independence of the X-ray tube. It is set in motion, whether for fluoroscopy or radiography, and the current is passed through the tube when and as long as desired independently, and is timed by the usual apparatus.

The *modus operandi* is simplicity itself: films are placed in a channel located behind the diaphragm, which is then set in motion. The exposure is made by pressing the button of the timer, as is done when exposures are made at present without a diaphragm, the timer alone controlling the time of exposure.

FOR FLUOROSCOPY

The fluorescent screen is applied against the cover protecting the lead strips, the patient being in front. The diaphragm is set

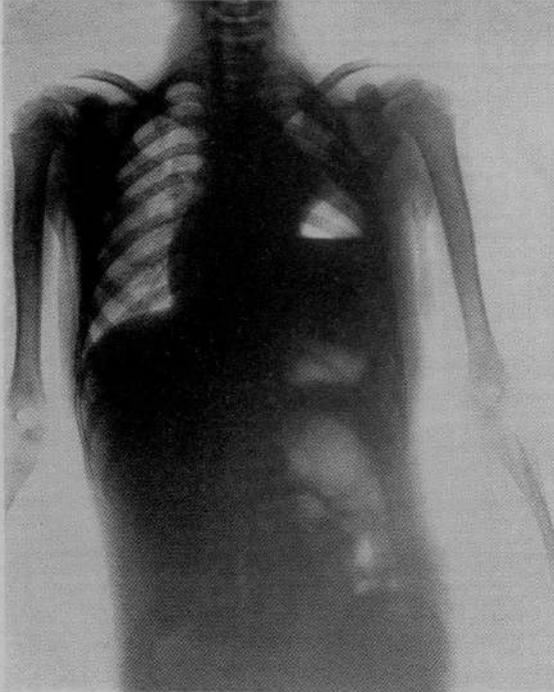


Fig. 7. Chest of a child, 6 years old, with pneumo- and pyo-thorax, at 72 inches; exposure, one-twentieth of a second.

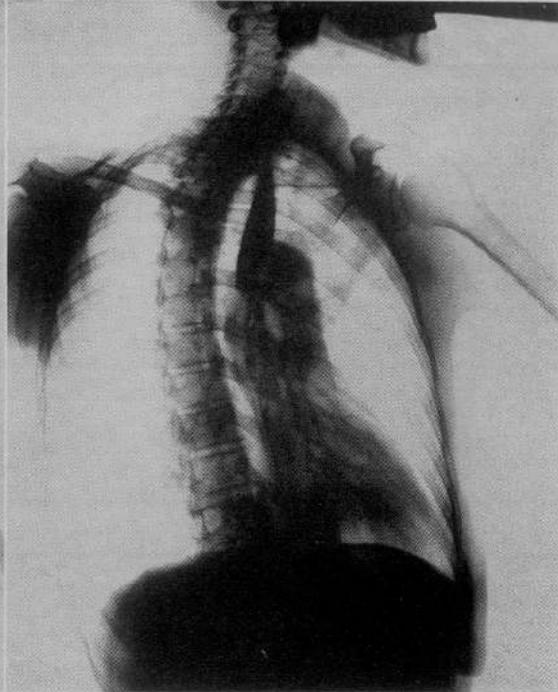


Fig. 8. Carcinoma of esophagus in the middle third. Note how the tissues infiltrated by malignant cells stand out clearly. As in all other illustrations, the reproductions must of necessity fail to give the richness of detail shown in the original films. Distance, 72 inches; time, one-tenth of a second.

in motion and the current passed through the tube in the ordinary manner. Observation on the fluorescent screen is made through the double layer of lead strips and is exceedingly clear.

Special apparatus is in process of construction for combined fluoroscopy and radiography.

We have taken films of the digestive organs (stomach, gall bladder, colon, liver, spleen) all on one film, at about forty-five inches in three-tenths of a second, and of the chest, trachea, and esophagus, at seventy-two inches in one-twentieth of a second. Some of the radiographs are reproduced as illustrations in this paper, though it is an understood fact that reproductions fail to give the true impression one receives from the original films. The films taken with this diaphragm have a brightness and a

lively character, lacking in films taken without the diaphragm described. Special mention should be made of soft-tissue revelation. The trachea, the epiglottis, the contour of tumors of the esophagus through the mediastinum, hairs, as well as silk and linen tissues and threads become plainly visible on the film.

We believe that this new diaphragm has a broad field of usefulness. The fact that it does not increase the time of exposure makes possible the elimination of secondary radiation on instantaneous films, thus giving them a most remarkable clearness of detail. The fact that it can be used at any focal distance allows elimination of secondary radiation on films at any focal distance, thus allowing clearer films of the chest at 72 inches or of the dense abdominal organs at 30 inches. The fact that it does not increase

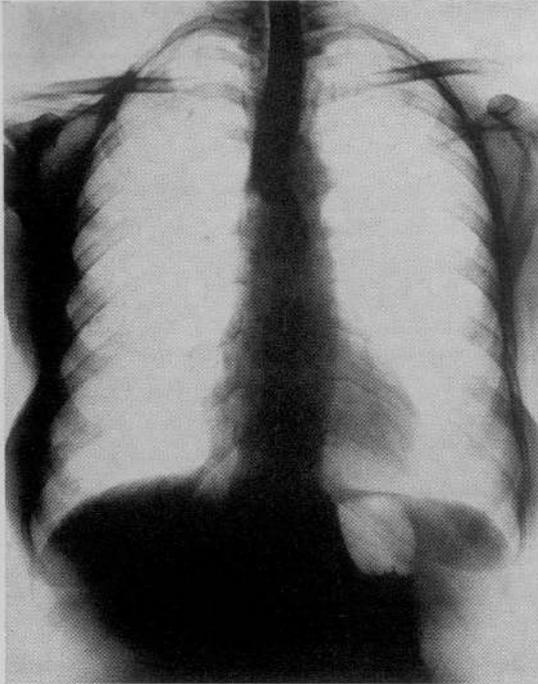


Fig. 9. Same case as shown in Figure 8, antero-posterior view. Note how the growth is shown through the mediastinum. Distance, 72 inches; exposure, one-tenth of a second.

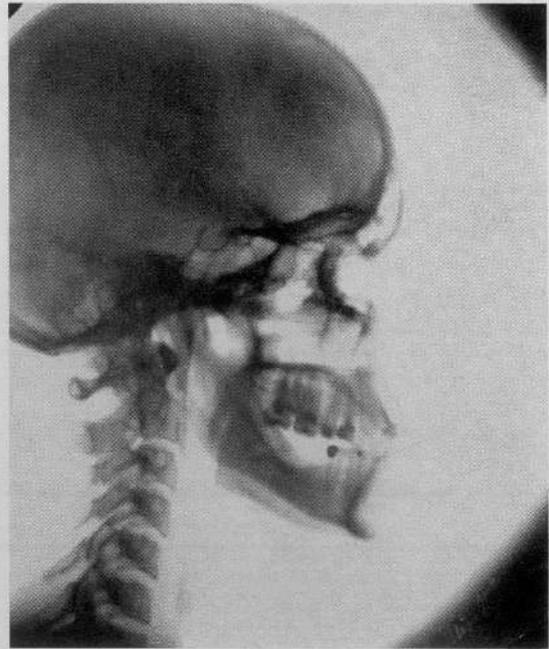


Fig. 10. Skull taken at 72 inches; exposure, one-twentieth of a second.

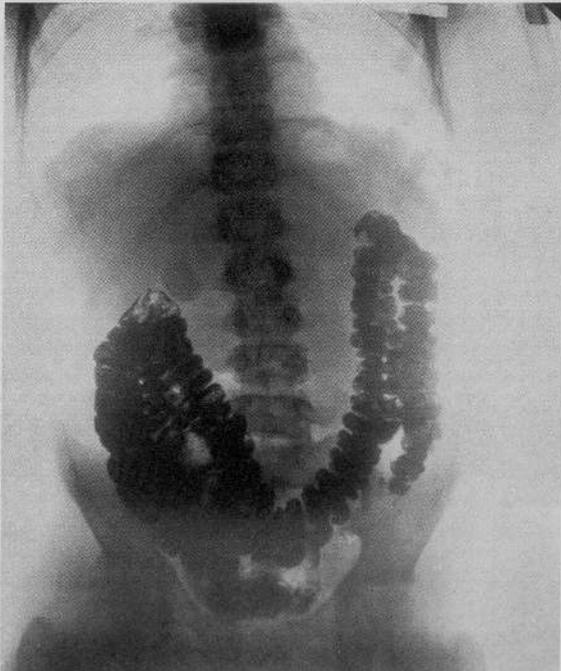


Fig. 11. Gall bladder and colon taken at 40 inches; exposure, four-tenths of a second. In the original film the spleen, the liver, and the right kidney are plainly visible.

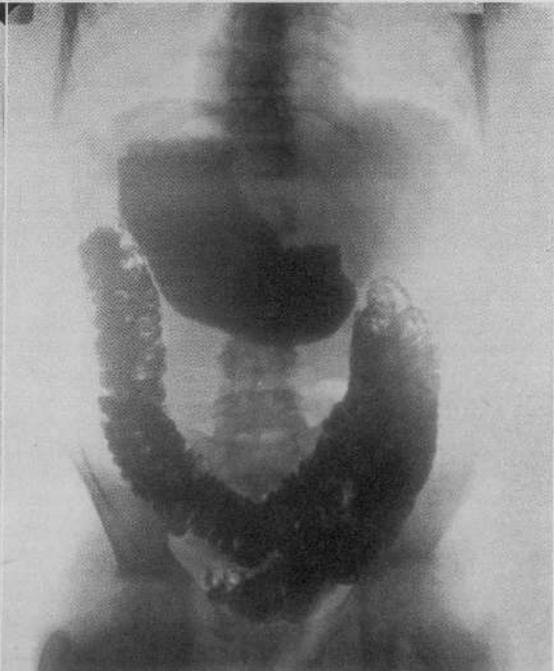


Fig. 12. Same case as shown in Figure 11, with the barium meal in the stomach.

the time of exposure makes radiography and radioscopy safer for patients, attendants, and tubes.

In conclusion, the writer hopes that the rapidly moving diaphragm herein described, with its unique features of abolishing secondary radiation while not increasing the time of exposure; its adaptability to any

focal distance, to any speed, to any position, to both radiography and fluoroscopy, will be of help to radiologists.

The writer wishes to acknowledge the intelligent co-operation of the staff of the Westinghouse X-ray Co., Inc., and especially of Mr. Wappler, Mr. Fayer, and Mr. Larson.

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