

three breathing appliances therefore indicates that all of the appliances give concordant values for oxygen consumption and that the mask gives the lowest values for carbon-dioxide elimination and respiratory quotient.

(To be continued.)

## THE RECONSTRUCTION OF A GERMAN SHELL SHATTERED ARM. THE REPORT OF AN HISTORICALLY IMPORTANT CASE.

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FROM an historical as well as a surgical point of view, it seems well to record the cases of John Zitz and John Bogovich, two members of the crew of the tug "Perth Amboy" attacked by a German submarine off Orleans, Cape Cod, on July 22, 1918.

From an historical standpoint these cases are interesting because, as far as can be ascertained, these men, both wounded by German shells, were the first and only American casualties of the war for whom all treatment, from first aid station to base hospital, was administered by the United States. Also this attack was the only bit of the European war to be seen from American shores and during it, the only German shell of the war landed on American soil.

From a surgical standpoint they are important because Bogovich presents an unusual case of bone transplantation and also an excellent example of a septic wound treated by the Carrel-Dakin method.

At 10.15 on the morning of July 22, 1918, a bright, clear day, the tug "Perth Amboy," towing four barges partly laden with stone, was fired upon by a German submarine. From the shore, the submarine was plainly visible about three miles out with the tug and tows one mile closer in. The first shell fell short of the tug, the next two far over it, but the fourth struck the pilot house where Zitz and Bogovich were stationed. Then followed about fifty shells, the submarine firing in rotation from a gun mounted on deck at the tug and the tows. By this time the U-boat was close onto the other vessels and every shot was a hit. From the shore, there could be seen a blaze of fire followed immediately by a cloud of smoke as a shell burst against

one vessel or another. Twenty-five minutes after the first shell was fired, a seaplane appeared from the Chatham Naval Station, seven miles away; but just before it reached the submarine, the latter submerged, with its aerial masts still visible, however, giving its exact location to the aviator. He dropped a depth bomb which did not explode, circled once, and started back to his station. As he did so, the submarine again came to the surface and fired at him. This shell the aviator heard pass by him and it was this shell that landed in a small pond about one mile inland, the first German shell to land in this country.

Two of the tows had by this time gone down, and the submarine began again its interrupted work on the tug and the other two barges. Altogether the bombardment lasted between forty-five and fifty minutes, the submarine riding practically all of that time on the surface of the water. With a third barge sunk, the fourth sinking, and the tug in flames, it submerged and was not seen again. It was indeed an amazing and exasperating spectacle to those of us who were watching from the shore, just two miles away.

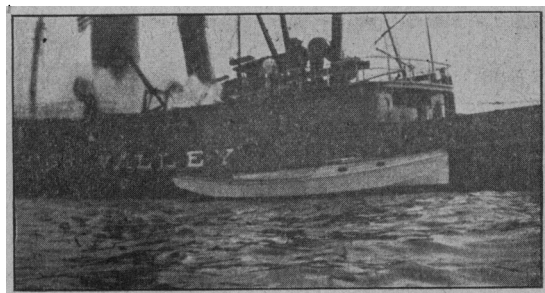


FIG. 1.—The tug *Perth Amboy*.

Zitz and Bogovich were brought to shore by the other members of the crew, being carried from the tug after the first shell had struck them. Zitz had a small shell wound on the outer side of his right knee but was otherwise in good condition.

Bogovich, on the other hand, in a moderate degree of shock, had a shell wound over the lateral border of his left scapula with the fragment definitely palpable just beneath the skin. His right upper arm was badly crushed with two deep jagged wounds just above the elbow.

The wounds were hastily washed at the Orleans Life Saving Station, sterile dressings applied, and the arm immobilized. Both men

were taken to the Massachusetts General Hospital. X-rays of Bogovich's arm and shoulder were taken which showed the shell fragment in the shoulder and the shattered condition of the right humerus.



FIG. 2.—Shell fragment in left shoulder, which was removed.

Bogovich was immediately anaesthetized and the shell fragment, about a three-quarter inch cube, removed from the back. The skin margins of the wounds around the right elbow were cut away, devitalized muscle and tissue removed, and many fragments of shell and bone were taken out. There was a fracture running between the condyles of the humerus, which extended into the joint. The condyles were pulled together with a ligature of kangaroo tendon, leaving a distal stump of the humerus of about one and one-half inches. The wounds were irrigated with quantities of sterile salt solution, followed by Dakin's solution, and four Carrel tubes were then inserted. The wound was treated by the routine Carrel-Dakin method of a daily dressing under aseptic precautions and bi-hourly instillations of Dakin's solution. Prints below show the patient at the time he was undergoing this treatment with the special Dakin carriage beside him.

At first the wounds discharged considerable pus which cleared up rapidly under the treatment, the tubes being removed one by one as the different parts of the wounds became free

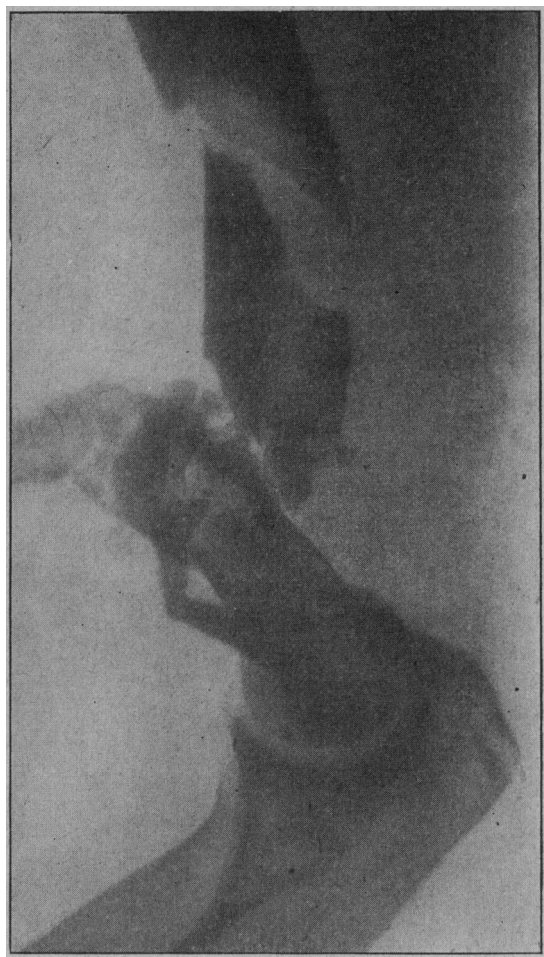
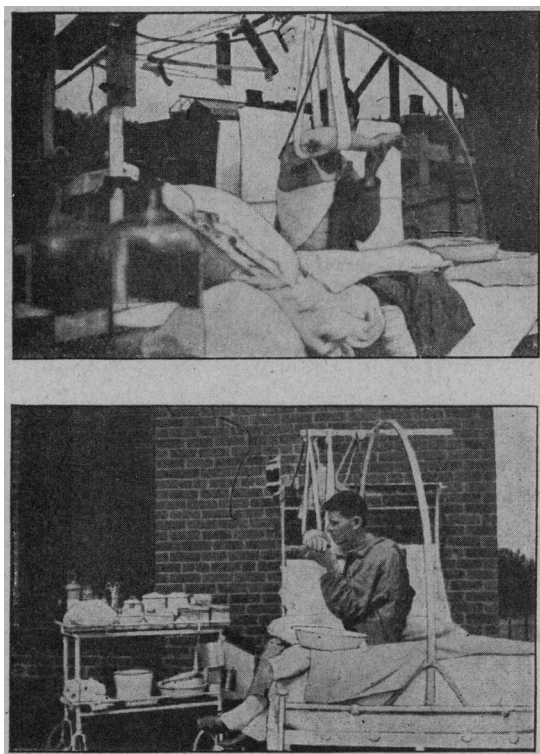


FIG. 3.—Humerus before operation.

of bacteria. The last tube was removed on August 28th, five and a half weeks after their introduction.

On October 16th, with the granulations completely covered with skin and all wounds entirely healed, Bogovich was sent from the hospital to rest for three months. His arm was at the time protected by a leather splint and a sling. The arm without the splint in position was flail because of the loss of bony substance from the lower end of the humerus.

He returned on January 25th of this year and was operated on a week later by one of us. The ends of the old fractured humerus were freed from the surrounding tissue and curetted. The medulla of the humeral shaft was opened and the distal fragment was prepared for the reception of the graft. The left fibula was exposed and six inches resected with periosteum attached. After the ends of the graft were shaped, and while maintaining traction on the arm to lengthen the gap of five inches between the ends of the bone, the graft was driven into



FIGS. 4 and 5.—Bogovich during the period of Carrel-Dakin irrigation.

the medulla of the proximal end of the humerus and made to engage in the cavity prepared in the distal end. On letting up on the traction, the graft was firmly fixed. The wound was closed in two layers and the arm put up in plaster, superimposed on an internal right angular splint. The X-ray print below shows the arm a few days after this operation: the upper

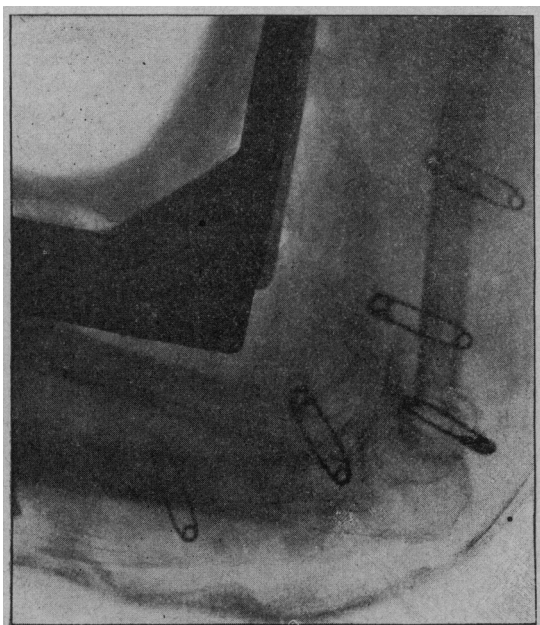


FIG. 6.—Immediately after operation.

end of the humerus indistinctly shows at the top of the print.

By overhead apparatus, the humerus was suspended at a right angle to the body and kept in this position about six weeks. X-rays taken from time to time showed the graft to be in good condition.

At the end of that time, the cast and splints were removed, stitches were taken out and another cast applied. This cast still held the forearm flexed to 90 degrees and the shoulder joint was immobilized by a plaster spica with the humerus now in its normal position. On May 3rd, the spica was removed, giving free play at the shoulder, and a simple plaster shell and sling applied to immobilize and support the elbow.

The graft was united solidly with the ends of the humerus. X-Ray shows the periosteum growing from the two ends of the humeral fragments. The patient already has about ten degrees of motion in the elbow joint. He has been receiving massage twice a week since May 1st. The size of the fibula fragment has increased as it has assumed its new function and everything points now to a strong joint with slight motion.

The case serves to illustrate the value of delay in performing a plastic bone operation until the initial sepsis has been entirely eliminated and until several weeks have elapsed to insure that

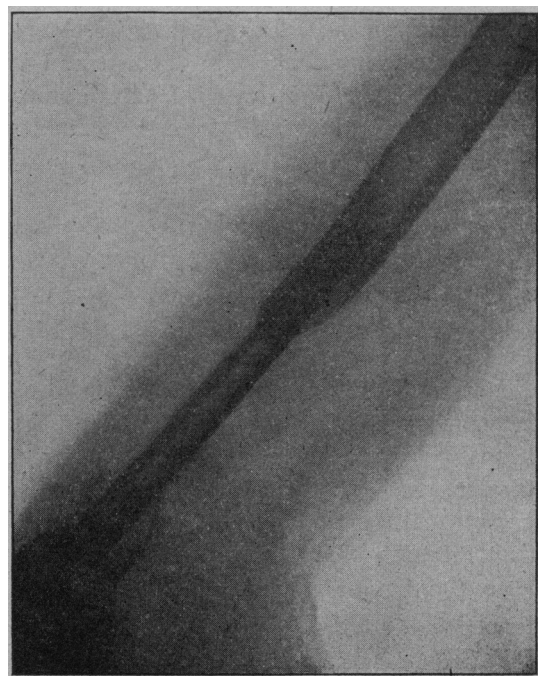


FIG. 7.—Some weeks after operation.

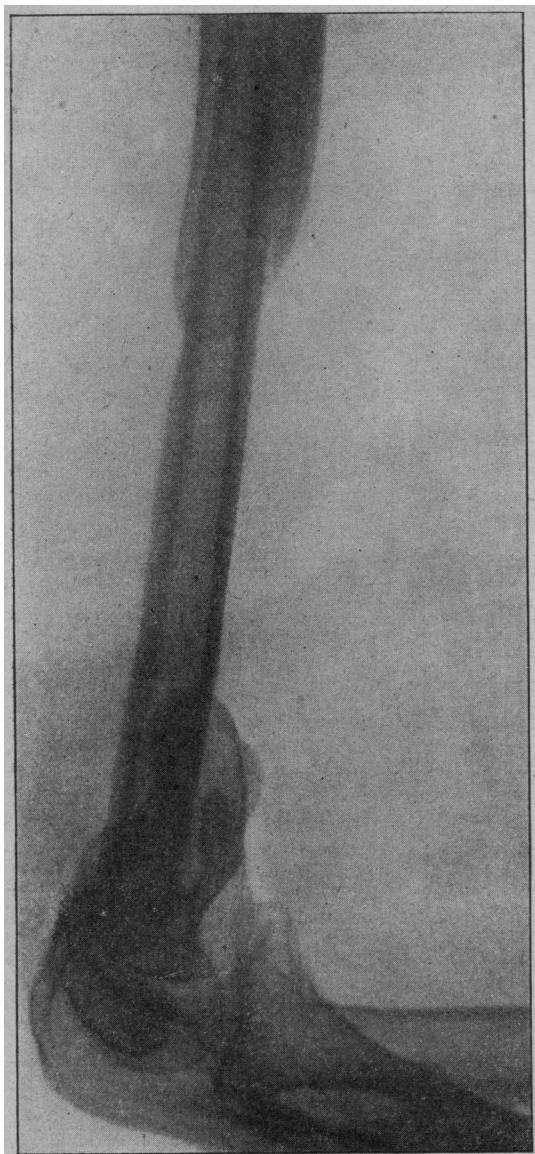


FIG. 8.—Latest x-ray of graft. Note security of ends of graft.

no recurrence of the infection will take place when the plastic operation is done.

In this case three months were allowed to pass before the bone plastic was done.



KANSAS UNIVERSITY MEDICAL SCHOOL.—The sum of \$200,000 was appropriated recently for the building for the Kansas University Medical School, which will be erected provided the City of Rosedale furnishes the additional ground needed, which is valued at \$60,000.

## A GRAPHIC METHOD FOR RECORDING CONJUGATE DEVIATION TESTS, AND ITS USE, ILLUSTRATED BY A CASE RECORD.

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This brief paper serves two purposes. It illustrates a graphic method (the writer's) of recording the condition found when testing for conjugate deviation of the eyes, and it publishes a bit of research work upon which is based the finding that conjugate deviation when found in epilepsy is not a constant, *i.e.*, unchangeable condition.

The writer heard Bárány state, in 1914, that the normal positions of the eyes when closed are (1) looking upward, (2) diverging, (3) converging; if both eyes look to the left or to the right, the positions are respectively conjugate deviation to the left and conjugate deviation to the right, and are abnormal. Bárány also stated that conjugate deviation is due to an increase of supra-nuclear tonus, and that the centres for motion of the eyes are in the cerebral cortex.

The writer, following Bárány's instruction, tests for conjugate deviation by having the patient look at him, and then telling him to close the eyes and keep them closed, not too firmly, while the writer with his thumbs gently but firmly pushes up the patient's upper eyelids, thus disclosing the position of the eyes. The positions in which the eyes are found are denoted by the following symbols:

- || denotes that the eyes look upward (normal)
- ↘ denotes that the eyes diverge (normal)
- ↙ denotes that the eyes converge (normal)
- // denotes that both eyes look to the *patient's* left, hence conjugate deviation to the left (abnormal)
- \\ denotes that both eyes look to the *patient's* right, hence conjugate deviation to the right (abnormal)

Each line of the symbols represents the line of motion the eye (or rather the cornea) travels from its position at the lower end of the line (with the eyes open) to its position at the upper end of the line, the latter being the position in which the eye is found on gently forcing upwards the upper lid in making the test. An advantage of the graphic method of representing the conditions found is that it permits of the speedy recording of conditions, evidently abnormal, yet not specifically so designated here-