Soon after the publication of Geyser's paper I secured one of the tubes from the makers of the original instrument. My experience with it was such that, shortly afterward, I ordered two more and, later, four more. The main fault I found with the tubes was their instability. Occasionally one would have a working life of fifty or sixty hours; the next would probably puncture the first time it was connected up. In addition to this, the small amount of space in the interior of the bulbs (which average only about 4.5 cm. in diameter) rendered a proper regulation of the vacuum extremely difficult. Because of these objections I had the manufacturers make for me a larger tube, the body being 12 cm. in diameter and the anode and cathode being separated by a space of 7.5 cm.

In order partially to protect the patient from the high-frequency sparks that are given off at the circumference of the window, the barrel is surrounded by a soft rubber band, 4.5 cm. in width, the outer edge of which projects slightly beyond the edge of the tube and comes in contact with the patient's skin. Enough stimulation is secured to ensure protection, and the patient experiences but slight discomfort.

I agree with Snow,² that the partial or complete immunity from dermatitis gained by the use of these tubes is due to a stimulation of the tissue activities which the rays ordinarily inhibit. By interposing a broad sheet of soft rubber (1 cm. in thickness) between the window and the closely shaven skin of a guinea-pig I have been able, on two separate occasions, to cause burns with exposures of less than fifteen minutes each.

The larger tube has proved very durable. After more than forty hours of use it is still in excellent condition. Although tubes of the Cornell type can not be satisfactorily employed in all cases, because of either the size of the lesion to be attacked, or the topography of the parts involved, they can be utilized in a large percentage of skin diseases in which the x-rays are indicated.

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PENETRATING WOUND OF THE LUNG

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The following case is of interest, not only on account of its very extensive character, but also as it illustrates a type of wound that has become extremely rare since men have discarded the spear in battle.

History of Accident.—The patient was a tall, well-muscled negro, 20 years of age, engaged in saw-mill work. On June 22, 1908, about 10:30 a. m., while in a stooping posture in front of his saw he was struck full in the throat by a rough, undressed, blunt-ended, pine strip, eight feet in length, and an inch by an inch and a quarter in diameter. The strip was caught in the teeth of the saw, which was making 6,000 revolutions per minute, and hurled like a javelin with terrific force. It made a ragged wound of entry in the median line of the throat, a half inch below the cricoid cartilage, went downward and to the right, beneath the skin and superficial fascia, behind the sternum and clavicle, over or through the apex of the right lung, crashed through the third and fourth ribs in the mid-axillary line, plowed beneath the muscles and fascia and presented beneath the skin over the seventh rib in the posterior axillary line, which it stretched to the utmost. It was submerged eighteen inches from its tip to the wound of entry. After making an effort to pull out the stick, using both hands,

the man fell and called for assistance from the other workmen, who also failed to dislodge the strip. The long end was then sawed off, leaving ten or twelve inches for a grip, and a physician summoned.

First Treatment.—Dr. J. T. Doles, of Ivor, Va., reached the patient an hour later. The man was profoundly shocked, and absence of the right radial pulse led to the conclusion that the subclavian artery had been torn. Having stimulated the patient, cleaned the parts and prepared two yards of iodoform gauze for packing, Dr. Doles enlarged the skin wound, without anesthetic, and withdrew the stick, the forefinger being thrust deep into the wound to disengage the splinters which hung on the fascia and muscles when traction was made. There was a tremendous gush of blood, but with long dressing forceps the gauze strips were packed as deeply and tightly as possible

From photograph of patient with penetrating wound of lung, taken before the tubes were removed. It shows: (I) the wound of entry healed; (II) a tube in the incision over the suprasternal notch; (III) the wound of exit in the posterior axillary line; (IV) the tube leading into the pleura at point of resection of the seventh rib and midaxillary line; (V) the tube in the upper arm of the U-shaped incision last made exposing the area of greatest trauma.

into the wound and soon the bleeding was under control. A large hematoma quickly formed over the seventh rib at the point of the stick. This was opened and a quantity of blood evacuated and the wound then packed with iodoform gauze for dependent drainage. Occlusive dressings were applied and moderate stimulation instituted.

The next day the patient had recovered enough to travel and was brought to Richmond and put under my care at the Virginia Hospital. On June 23, the second day after the injury, the temperature was 102, the pulse 118; there was no cough or bloody expectoration, and no pain; there was dullness over the upper right lobe, well-marked emphysema under the skin in the axillary region over an area larger than the hand. Respiration was about 22; dressings saturated with blood and serum, throat and side both draining profusely. For a week the patient's condition remained about the same, the temperature never going over 102, the pulse 120, and respiration remaining

2. Jour. Advanc. Therap., January, 1909, p. 52.

about 22 to 24. He seemed comfortable and gave no evidence of a pneumonia (as commonly accepted). The drainage, still sero-sanguineous, was most profuse. An x-ray by Dr. A. J. Gray showed consolidation of the upper lobe, but the iodoform gauze did not cast a sufficiently heavy shadow to map out the track made by the stick, as I had hoped. The drainage strips had been shortened from day to day and on the 29th, the seventh day after injury, I removed, as I believed, all, reaching well below the clavicle to get the buried end, and replacing fresh gauze in both wounds. Dr. Garnett Nelson made a physical examination and reported fluid in the pleural cavity. The patient's temperature was running from 103 to 104 and his pulse 120.

First Operation.—On July 1, the tenth day after injury, the seventh rib was resected in the mid-axillary line, lengthening the wound of exit. A cavity was found as large as the fist but I could touch the lung on all sides. About a pint of dark serum was evacuated and the patient had a lower temperature and seemed much improved for several days. The original wound of exit at the seventh rib had healed. The throat wound was pouring out quantities of green pus, but the high skin flap held this back, puddling it in the wound.

Second Operation.—On July 5, the fifteenth day after the injury, I made an incision under cocaine just above the supra-sternal notch and with my finger as a guide introduced a large rubber tube over into the apex of the right lung. This drained profusely and kept the cavity empty, the patient being turned on his left side. The improvement following this step was but temporary. The pleural operative wound was all this time draining serum, while pus flowed from the incision in the neck. On July 11, the twenty-first day after the injury, the original counter-incision reopened and drained thick greenish pus.

Third Operation.—On July 15, the twenty-fifth day after the injury, under cocaine, I prolonged the puncture wound upward and backward, following a sinus that led toward the axilla close to the ribs. Several pieces of pine bark escaped, and a good-sized rubber tube was put in. Pus now flowed freely from this wound and the neck incision, but only serum from the pleural cavity.

My conclusions were that the stick had gone diagonally through the apex of the lung (this idea was warranted by the emphysema), burst through the seventh interspace, post-axillary line; that adhesions of parietal and visceral pleura around the wound of exit had taken place; that the splinters and bark had caused the sinus to suppurate and reopen below, leaving the pleura cut off and draining serum. Improvement was again only temporary. Though the drainage was profuse, the patient's temperature ran higher, reaching 104; his pulse was rapid and weak. He began to lose flesh and strength. There was marked dullness behind, extending below the tip of the scapula. Thinking to find pus retained here I again operated, this time under chloroform.

Fourth Operation.—On July 20, the thirtieth day after injury, a large piece of the seventh rib was resected, revealing the lung, now completely collapsed. Next the wound of exit was enlarged and its sinus dissected up toward the axilla, several pieces of bark were removed and a good sized piece of iodoform gauze that lay between the muscles and the ribs. This had been packed in across the chest from above or had gradually worked down the sinus. Two loose pieces shattered from the third and fourth ribs, one and one-half and two inches long were removed. The incision was carried up anteriorly, making a horseshoe flap, which was raised so the area could be thoroughly cleansed and a large drainage-tube placed in the upper angle, giving a more direct route to the infected area. The sharp edges of the ribs from which the pieces had been broken could be plainly felt. The flap was sewed back, leaving small drains below and a tube of good size in the pleura. The throat wound was next explored and a piece of bone as long and as broad as the first joint of the thumb was taken out of the sinus behind and below the clavicle. This evidently was split from the manubrium.

Postoperative History.—Improvement was now rapid, drainage soon materially lessened and he was soon out of bed. Small bits of bark continued to work out. He was required

to blow water from one lithia bottle to another several times a day and under this exercise his lung rapidly expanded. Before the tubes were removed a second x-ray plate was taken to show the track of the sinus by the drainage tubes. The patient left the hospital August 18, at the end of the seventh week, with a well-expanded lung and but little drainage. The latest report received is dated November 14. The patient is able to do some work, is not as strong as before the accident, but feels well. Wound 2 in the throat still discharges a little and a number of splinters and pieces of pine bark have been extruded. The other wounds have healed.

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A MODIFIED APPARATUS FOR FRACTURE OF THE CLAVICLE

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Of the bones of the body the clavicle is perhaps the one most frequently broken. Hence the frequency with which practitioners are called on to treat this form of injury. In the greater proportion of these cases, as is

Fig. 1.—Front view of patient with dressing for broken clavicle applied.

known, the break occurs near the junction of the middle and outer third of the bone.

The clavicle fills the office of a brace and acts to prevent the shoulder from falling on the thorax. When the clavicle is broken the shoulder will fall downward, forward and inward. The action of three muscles, the sternomastoid, the trapezius and the pectoralis major, are of great importance in considering the proper treatment of these cases. The two former muscles tend to pull the fragments upward. The fibers of the pectoralis major that take their origin from the highest part of the clavicle, because of the semirevolution made by the tendon of this muscle, are attached lowest down along the bicipital groove of the humerus. By forcing the elbow far backward the fibers of the great pectoral are pulled on, the upward pull of the two muscles mentioned is counteracted, and the tendency of the fragments to jut up under the skin and show as a deformity is overcome.