horizontal position (see Fig. 4763, loading upper berth, No. 2); No. 3, inside at the front, and No. 2 on the rear step, place the left (or right) handles in the receiving sockets and slip the straps over the right (or left) han-

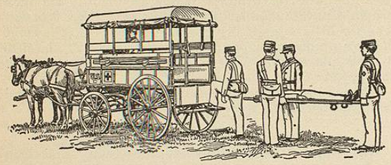

FIG. 4762.—Loading Upper Berth, No. 1.

dles. Nos. 1 and 4 assist in loading by supporting the litter on their respective sides until the handles have been secured; No. 3 steps over the front seat, jumps to the ground, and the squad takes position at ambulance posts. No. 4 places the arms and accoutrements of the patient, if any, in the hammock, and then takes his position on the right; Nos. 1 and 3 close the tail-gate and, if necessary, lower the curtain. The squad may then be faced to the left or about and marched in any desired direction.

(*a*) The squad being *at ambulance posts:*

1. *For lower berth prepare to unload;* 2. UNLOAD.

At the first command, Nos. 1 and 3 raise the curtain, if necessary, open the tail-gate, and No. 2 takes hold of

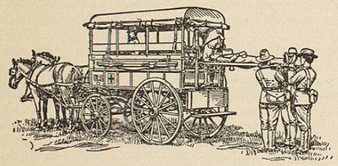

FIG. 4763.—Loading Upper Berth, No. 2.

the protecting handles of the litter; at unload, No. 2 draws out the litter, assisted by Nos. 1 and 3, who, facing inward, support the poles until the inner handles are reached. The litter, carefully supported in a horizontal position, is then lowered with the head of the patient two paces in rear of wagon; No. 4 closes the tail-gate, and all take posts at the litter.

(*b*) The squad being *at ambulance posts:*

1. *For upper berth, prepare to unload;* 2. UNLOAD.

At the first command Nos. 1 and 3 raise the curtain, if necessary, and open the tail-gate; No. 3 runs to the front of the ambulance, climbs in, stepping over the front seat, and faces the rear, grasping the front handles. No. 2 mounts the step and grasps the rear handles. Nos. 1 and 4 face the litter (see Fig. 4764, unloading upper berth). *At unload,* the handles are lifted and freed from their fastenings by Nos. 2 and 3; the litter is carried out, Nos. 1 and 4 on their respective sides supporting the litter, first at the foot and then at the head, as Nos. 2 and 3 step down from the ambulance. The litter, carefully supported in a horizontal position, is then lowered, with the head of the patient two paces in rear of the wagon; No. 4 closes the tail-gate and all take posts at litter.

(*a*) To load lower berth with two bearers, the litter being lowered in position for loading, at *prepare to load,* the bearers take posts on their respective sides, mid-length of the litter and facing it; they stoop and grasp each pole firmly with both hands. At *load,* they lift the litter and push it into the ambulance.

At *unload,* each bearer grasping his handle, they partly withdraw the litter, then shifting their hands to their respective poles and facing each other, they continue to withdraw it until the head reaches the rear of the ambulance, when they lift the litter out and lower it to the ground.

(*b*) To load the upper berth with two bearers, the lower berth is first loaded, as here described, and the litter is then lifted to its position and secured, one bearer inside the ambulance at the front handles and the other on the step at the rear handles. To unload, this movement is reversed.

The right side of the ambulance is always loaded or unloaded first, unless otherwise ordered. With more than one recumbent patient, the upper berth should be the first to be loaded and the last to be unloaded. The lower berth is the last to be loaded and the first to be unloaded.

When necessary to load the feet first at the commands: *By the feet, take post to load ambulance, march,* the litter is lowered with foot toward the ambulance, when the loading proceeds as above described, excepting that No. 3 remains between his handles, No. 2 takes post opposite the right ankle, and No. 4 opposite him.

At the conclusion of the drill with ambulances the detachment is reformed in line.

Two-wheeled ambulances designed to be drawn by a single animal have met with favor in nearly all the European armies, and during the Civil War were supplied to the United States troops. They are usually made to accommodate two recumbent or four sitting-up cases. Their principal advantages lie in their lightness and ability to cover ground which is impracticable for a four-wheel vehicle. They proved to be unsatisfactory in our Civil War, and were generally unfavorably reported upon by the medical officers who had had experience with them. They were found to be uncomfortable to their occupants on account of the jolting, and, being of light construction, were easily broken. The reason they have met with more favor in Europe than in the United States is no doubt due to the fact that our roadways are generally inferior to those of Europe. There can be little economy in their employment, as their carrying capacity is less than half that of our present service ambulance. Theoretically, a light two-wheeled vehicle should be admirably adapted to the removal of the wounded from the battlefield; but practically this can be done more expeditiously and with greater comfort to the wounded and safety to the injured and their bearers by hand-litters. The British in the South African War made use of the Indian "tonga," a light two-wheeled vehicle drawn by two ponies, for the transportation of wounded; it accommodates two recumbent patients. It is reported as having given satisfaction, and is described as being "so well arranged and padded that the occupants are seldom hurt by striking against the sides with rough jolting, unless quite helpless."

In cities the motor ambulance has almost entirely superseded the horse ambulance in the transportation of the disabled. However satisfactory this vehicle has proved to be for urban use and in regions where good

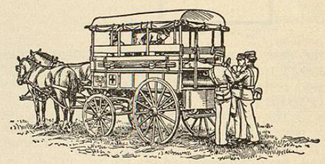

FIG. 4764.—Unloading Upper Berth.

roads exist—and its superiority under such conditions is unquestioned—it is doubtful whether it can ever entirely replace the present service ambulance in the transportation of the sick and wounded of the military service. A

military ambulance must be able to go over any ground practicable for wheeled vehicles—over steep grades, through mud, sand, and ruts. Its construction must be simple, so that it can be managed by the average enlisted man, and when disabled must be capable of being readily repaired with the materials at hand and by the men who accompany it. The motor wagon does not as yet fulfil these requirements. About the base and at times perhaps along the lines of communication a motor ambulance would prove a satisfactory substitute for the present service wagon; but only exceptionally could it accompany the field hospitals or reach the ambulance stations. In several of the European armies motor vehicles are used for hauling wagon trains and transporting staff officers, couriers, and supplies, and recent trials have demonstrated that, within certain limits, this means of transportation is feasible for military purpose. Perhaps the future will develop a motor ambulance which can be used under all military conditions. The advantages of such a vehicle would not be inconsiderable; there would primarily be a great saving in the transportation of animals and forage; the fuel, if it be a fuel motor, would probably be of small bulk; and the increased speed of such a vehicle would extend its operations and increase its carrying capacity. So far as known to the writer, a motor ambulance which fulfils all the requirements of the military service has not yet been produced.

Circumstances must often arise when ambulances are not available for the transportation of the disabled, and after an important engagement with excessive casualties the number of ambulances, even with a most liberal allowance, will hardly ever be sufficient in number to remove promptly all the wounded; so, too, in the service of evacuation from the field into base and general hospitals, rarely will it happen that additional transport will not be required. Recourse under such conditions must then be had to other means. If railroad trains are impracticable, there will usually be army wagons, and the wagons and carts of the country; at times artillery caissons, though poorly adapted to this purpose, have been so employed. Where cots or litters are at hand, they should be used for the recumbent patients; the army wagon, with cover, which can carry two recumbent patients on litters or cots, or three recumbent without litters, or eight sitting-up cases, has often proven a satisfactory substitute for the ambulance.

When litters or cots are not available, the bottom of the wagon should be covered with a bed of hay, straw, leaves, or other material. Wagons with springs, for obvious reasons, are always to be preferred. Elastic rods of wood, properly covered with canvas and hay, laid across a wagon box, make a very good springy bed, or such a bed may be made by interlacing straps or ropes across a wagon body. Hay wagons with a thick layer of hay in the bottom make fairly comfortable conveyances for the disabled. Sleighs and sleds suggest themselves as excellent means for the transportation of the sick and wounded; the advantages of their employment under favorable conditions are so evident that further remarks regarding them are unnecessary.

In the service of evacuation, by which is understood the transportation of the sick and wounded from the field or division hospitals to the more permanent hospitals at the base and beyond, the means of transportation already mentioned will usually be inadequate, even if these means were available for such service. General and base hospitals are usually located with a view to their accessibility of communication with the operating force; if roads do not already exist, they are constructed as the troops move on. So, too, if the exigencies of the campaign require railroads or lines of steamboats, these will be constructed or established. Thus the means of transportation that carry forward troops and supplies to the front may be utilized in bringing back the disabled. The service of evacuation is of importance, as by it the field hospitals are emptied, enabling them to move promptly and expeditiously with their respective commands, holds them ready for the reception of the sick and wounded from subsequent military operations, and removes centres of disease from the active army. Besides, at the more permanent hospitals the sick and wounded can be better cared for than would be practicable in a moving hospital.

In some of the European armies hospital trains, made up of cars especially constructed and equipped for carrying sick and wounded, are maintained as part of the transportation of the army. In such trains the hospital cars are fitted up as wards, the beds being either fixed berths or litters are used as berths, upon which patients may be carried to and from the cars. The regular hospital car of the German hospital train has twelve beds with hair mattresses, bedside tables, two reclining chairs, hammocks for clothing, lavatories and lockers. The beds can be lifted off and used as litters, and are arranged on a system of springs, allowing universal motion. A kitchen car is attached to each train, and is equipped with ranges, refrigerators, cooking utensils, and crockery, etc., sufficient for three hundred sick. A freight car is also attached, for carrying baggage and stores. Hospital trains are more often improvised from such rolling stock as may be available, and for this purpose sleeping-cars, passenger coaches, baggage and freight cars may be used.

During the War of the Rebellion in the United States many thousand wounded were transferred from the front to general hospitals by rail; after the battle of Chancellorsville, for instance, 9,000 men were moved from the army in three days; and after the battle of Gettysburg 15,425 wounded were moved in fifteen days. In several cases more than a thousand patients were reported as having been carried upon a single train. It is manifestly impracticable to have at hand sufficient regularly fitted and equipped hospital cars to transport such large numbers of disabled men, and in the instances above cited the trains were composed almost entirely of freight cars, both box and open cars; the floors of the cars were covered with a thick bed of hay, grass, straw, or leaves, upon which the patients were laid; the open cars were covered with an improvised roof of canvas.

Ordinary passenger coaches are also used for carrying sick and wounded; in some cases the seats are removed and the patients laid upon the floor, either upon litters, or upon bedsacks, or loose hay or straw. Where the seats are not removed, berths may be made by laying boards across from seat to seat or over the backs of the seats. During the war just referred to our hospital trains were usually composed of freight cars and passenger coaches, which had been converted into hospital cars by placing two rows of stout stanchions on each side of the car at distances corresponding to the length and breadth of the litter. From pins or hooks fastened to the stanchions the litters were suspended in two or three tiers, depending on the height of the car. In some cases india-rubber rings were employed for suspending the litters, on the theory that the elastic action of the rings would minimize the vibration and jolting; experience demonstrated, however, that if the rings were thin enough to permit their elasticity to come into play the jolting was increased; while, on the other hand, if the rings were thick and strong, there was no elastic action, and any other method of suspension acted as well. In another plan, fixed berths were constructed in the cars by means of boards and stanchions arranged as described above. Upon these the patients were placed either upon the litters which brought them to the train, or upon mattresses or bedsacks filled with straw. In the recent Boer War in South Africa the British converted freight cars into hospital cars by this method; the berths were arranged in two tiers (Fig. 4765). Makin says of these cars that they "seemed to offer little scope for improvement except in minor details. To them much of the success in the treatment of the wounded, who had to traverse the immense distances incident to South Africa, must be attributed." A train of hospital cars fitted up in England and sent to South Africa, in which the berths were arranged in

three tiers, was reported upon as having been less satisfactory.

In the German army the regular hospital trains are supplemented, when the necessity therefor arises, by improvised trains composed of freight cars. For this purpose "knock-down" lockers for carrying the required equipment, and springs which reach across the bottom of the car, each of which will support four litters, are held in readiness.

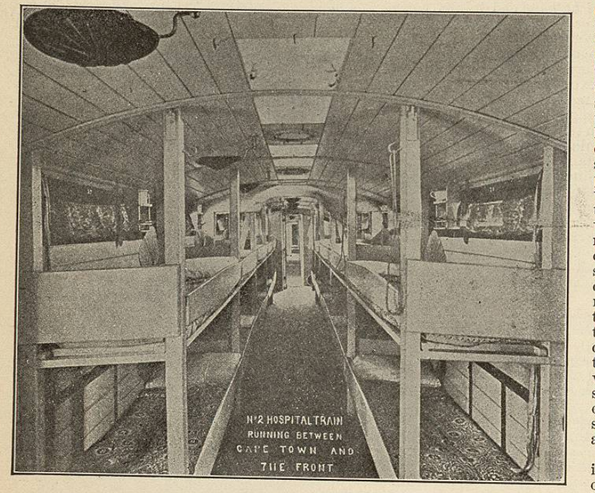

FIG. 4765.—Interior of British Hospital Car. (After Makin.) (Boer War in South Africa.)

In another arrangement litters are suspended from supports by means of chain slings with spiral springs.

In the English, French, and Norwegian services freight cars are converted into hospital cars by a system in which the litters are supported in two tiers in hinged frames, suspended from ropes running across the top of the cars. In this system, which is known as Zavodovski's (Fig. 4766), the frames in which the litters rest are not rigidly fixed, thus permitting a slight swaying motion, which to a certain extent relieves the vibration and jolting.

During the Spanish-American War a regularly equipped hospital train was in operation transporting sick and wounded from the different division hospitals to the general hospitals. This train was composed of ten hospital cars, a kitchen and dining car, a combination car, and a so-called "private" car, which latter was used as quarters for the officers of the train. The hospital cars were of the type known as Pullman "tourist" sleeping-cars, chartered from the Pullman Company. In these cars the seats, which are arranged in pairs facing each other, may be converted into beds; above these seats is a tier of beds, secured by hinges to the side of the car; when not in use these beds are swung up to the roof and locked there by suitable fastenings. The space under the seat is enclosed, forming a box in which the bedding is kept when not in use; the upper berth, when closed, contains its bedding likewise. Each car has lockers for bed-linen and clothing, fixed wash basins, water tanks, and closets. In this train each berth was supplied with mattress, sheets, pillow, and pillow case, and a pair of blankets, and each car was provided with the usual appliances needed in a hospital ward, such as bed-pans, urinals, basins, etc. The cars were without carpets or curtains, for obvious reasons; the seats were of woven cane, a point of some moment where sick and wounded are to be carried. Some of the cars had twenty-four berths, others twenty-eight, making the capacity of the train about two hundred and forty. If only convalescents were to be carried and the journey was of short duration, the train could accommodate double that number without crowding. The dining and kitchen car was of the pattern used in the passenger service of our railroads. It contained a compact and complete kitchen, with range, refrigerators, cooking utensils, and appliances sufficient for the full carrying capacity of the train. In this kitchen were prepared all meals for patients, including special diets, as well as those for the entire personnel of the train. The combination car contained a baggage and a passenger compartment; the baggage compartment was the train storeroom, in which were carried patients' effects, stores, tools, bedding, tents, litters, etc.; the passenger compartment, from which most of the fixed seats had been removed, was used as the train office, dispensary, and operating room, and was equipped with desk, medical and surgical chests, and a folding operating table.

In loading the train with patients it was "broken" after every second car, sufficient space being allowed between the cars to permit of easy handling of the litter; this was passed upon the platform by two bearers, one end reaching through the doorway; from here it was taken by another squad of two men who carried it into the car, and with the assistance of a third bearer transferred the patient to the bed. Patients requiring special attention or who were helpless were placed in lower berths, where they could be more conveniently attended. Upon the arrival of the train at its destination it was again "broken" beyond every second car; the recumbent patients were placed upon the litters, which were passed out in the same way in which they were taken in.

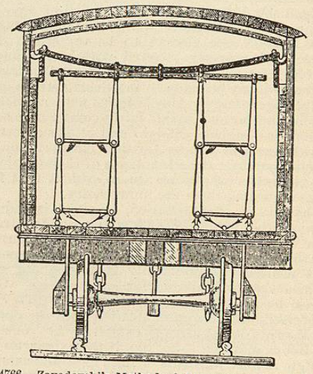

FIG. 4766.—Zavodovski's Method of Improvising Hospital Cars.

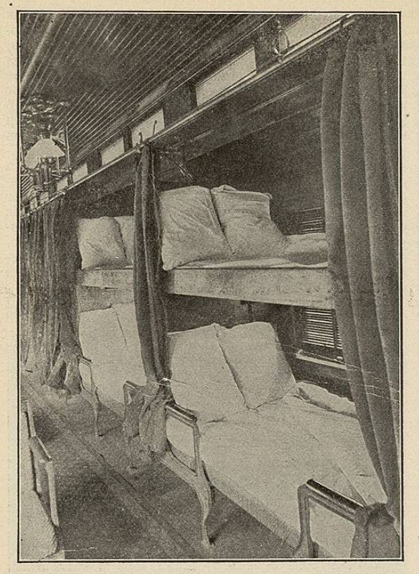

FIG. 4767.—Interior of Tourist Sleeping-Car, with Beds Prepared. Used during Spanish-American War, 1898. (This illustration should be without curtains or carpet.)

Stress has been laid by military surgeons upon the advantage of transporting patients (especially wounded) on trains upon the litters which bring them; this advantage is more fancied than real, as with trained men patients, even though severely wounded, can be safely and comfortably transferred from litters to beds and from beds to litters.

In the instances where the receiving hospitals were situated at a distance from the railroad track, electric street cars were used to transfer patients from the train to the hospital. In these, recumbent patients were placed upon mattresses laid upon the seats and upon litters resting on the floor. When the hospital was near the railroad track, patients were transferred to it by hand-litters or ambulances.

This train was not merely a railroad ambulance, but a moving hospital, organized and equipped to treat sick and wounded as well as transport them. Its personnel was quartered and subsisted upon it during the entire period that it was in operation, and the usual hospital routine and discipline were observed. It made many journeys of more than a thousand miles in length and of two days' duration. Patients were examined and prescribed for on admission, and their diagnoses were recorded; while en route regular morning and evening visits were made, and the more seriously ill were visited as often as was deemed necessary; wounds were dressed and minor operations performed. Cases of all kinds, except contagious diseases, were carried, and it is worthy of note here that they generally bore the journey well in spite of the heat and dust which prevailed during the summer months. Even typhoid-fever cases in the first week and during early convalescence were not unfavorably affected, though those in the height of the disease, as might have been expected, did poorly.

Cars of the type constituting this train are heavy in weight and construction, and are mounted upon six- or eight-wheel trucks; they are supported upon the trucks by an efficient system of springs; these factors tend to lessen the vibration and jarring incident to all railroad travel, a matter of consideration where sick and wounded are to be carried. Such cars have ample window space, are readily ventilated, and easy to keep clean; the aisle running through the car lengthwise from door to door between the beds permits of convenient and expeditious loading and unloading of the litter cases, while the facility with which the seats can be converted into beds and *vice versa*, enabling patients to sit up or lie down as the necessity of their cases might require, is a valuable feature possessed by no other improvised hospital car. Fig. 4767 shows the interior of such a car with beds prepared; Fig. 4768, with seats prepared.

Undoubtedly the best type of railroad car for the improvised transport of sick and wounded over long distances—in the United States at least—is the Pullman tourist sleeping-car, or a car similar to it in construction and arrangement.

Hospital trains composed of cars especially devised and constructed for the transportation of the sick and wounded of the military service would possess many valuable features, which are either impracticable or impossible in any improvised arrangement, and would be most desirable adjuncts to an army. Few governments, however, find it expedient or necessary to maintain such trains on hand ready for use; consequently such means as are available or can be speedily made so will have to be employed. For short hauls and in sudden emergencies almost any kind of rolling stock can be used, and will prove satisfactory. Baggage, freight, and ordinary

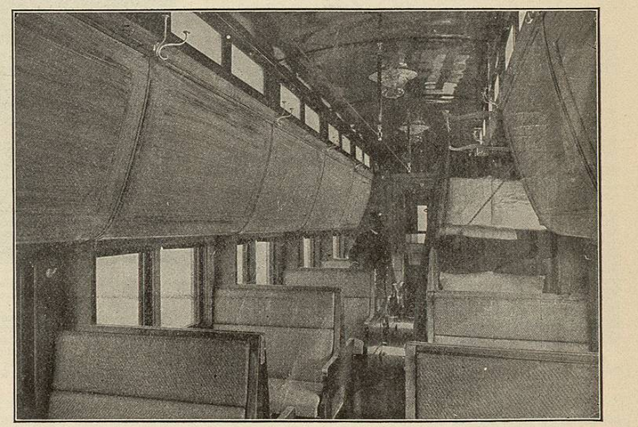

FIG. 4768.—Interior of Tourist Sleeping-Car, with Seats Prepared. Used during Spanish-American war, 1898.

passenger cars are usually at hand, as they will have brought troops and supplies to the front, and under these conditions may be used without making any changes in them. But for systematic work, as in the service of evacuation, and where sick and wounded are to be transferred over distances requiring more than three or four hours of travel, better arrangements should be provided. Under such circumstances, in the absence of specially devised and equipped hospital cars, sleeping-cars of the type described above are desirable. When these cannot be secured, such cars as may be available must be so arranged as to permit the transportation of the sick and wounded with the least discomfort. Fixed berths or supports for litters must be erected; a water-supply, water-closets, lockers for linen, seats for attendants and for patients who are able to sit up, should be provided. If box cars are converted into hospital cars, special provisions must be made for heating, lighting, and ventilation. One car will be fitted up as a kitchen and dining car, with range, cooking utensils, refrigerators, dishes, tableware, etc., sufficient for the full carrying capacity of the train. Another car will be arranged as office and dispensary and storeroom, with desk, medicines, medical and surgical chests, and medical stores.

The necessary personnel of a hospital train will depend upon the capacity of the train, the character of the patients carried, and the length of the journey.

The Manual for the Medical Department of the United States Army, edition of 1902, gives as the personnel required for a hospital train of nine cars, seven of which are used for patients with a capacity for two hundred men, the following:

Two Medical Officers.—One captain, assistant surgeon, commanding. One lieutenant, assistant surgeon.

Three Non-Commissioned Officers of the Hospital Corps.—One sergeant, first-class. Two sergeants.

Twenty-four Privates of the Hospital Corps.—Twenty nurses. Two cooks. Two medical officers' orderlies.

The number of non-commissioned officers here prescribed will prove adequate, but the medical officers and privates are not sufficient in number. One medical officer will usually be detailed as quartermaster and commissary of the train, and would only occasionally be free to attend patients, leaving but one other officer to look after the professional needs of two hundred patients and attend to the numerous other duties incident to a service of this character; three medical officers would be more satisfactory. If the journey to be performed be twenty-four hours or more in duration, and if it be assumed that each hospital car carries at least twenty-four patients, three nurses will be needed to each car—two for duty during the day and one for night duty; two additional men would also be required for work in the dining car. There is no economy apparent in limiting the number of cars for patients to seven; ten cars could be as easily hauled and administered; this would increase the capacity of the train by one-third, and would only necessitate an increase of three nurses to each car.

The problem of the transportation of the disabled in the military service is one which confronts the military surgeon under varying conditions and circumstances, and is no less a question of importance to the military commander. In many wars lives have been lost which might have been saved had adequate means of transportation been at hand. Even at the present day the means at our disposal are often crude and still limited; advance has been made, more yet remains to be done. War can never be waged with comfort to its participants. Nevertheless it behooves us as military surgeons to mitigate its horror and suffering as best we may. Improvements in both means and methods of transportation for the disabled will contribute to this end. *Charles Richard.*

TRANSPOSITION OF THE VISCERA.—(Synonym: Situs Viscerum Inversus.) DEFINITION.—In this condition the relations of the various organs of the body are exactly reversed; right and left are changed about like the reflection in a mirror. As applied to the heart, this organ is on the right side of the chest, with the apex directed outward, giving the anomaly known as dextrocardia. The lungs may take part in the transposition, the left having three lobes and the right two. The position of the aorta and its branches may be reversed. The spleen is located in the right hypochondrium and the liver in the left. The stomach may also be affected in this change, the fundus lying to the right of the median line and the pylorus to the left. The sigmoid may lie on the right side of the abdomen and the cæcum and appendix vermiformis on the left. Transposition of the viscera may be *total* or *partial*. The heart alone may be transposed; or the transposition may be limited to one or more of the abdominal organs. Complete transposition is much more common than partial. The congenital transposition, which is under consideration in this article, must be carefully distinguished from acquired displacements of organs, such as the dextrocardia due to traction or pressure from disease in the thoracic cavity.

HISTORY.—Gruber made a remarkable collection of all cases found in literature up to the year 1865. Of the 79

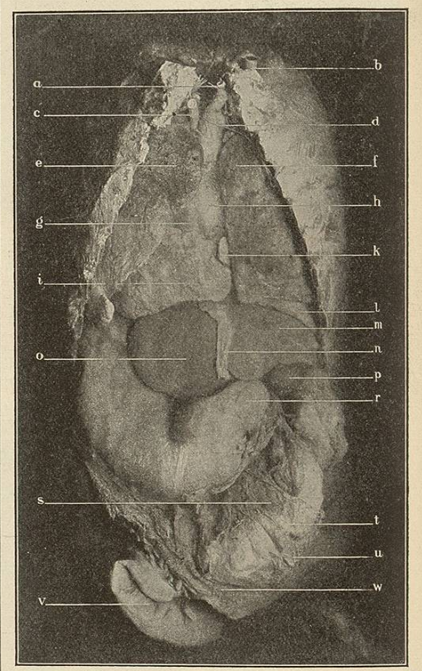

FIG. 4769.—Dr. Blackburn's Case of Transposition of Viscera. Photograph. *a*, Right common carotid artery; *b*, innominate vein; *c*, left common carotid artery; *d*, innominate artery; *e*, left lung (?); *f*, right lung (?); *g*, pulmonary artery; *h*, aorta; *i*, right ventricle of heart; *k*, appendix of right auricle; *l*, diaphragm; *m*, right lobe of liver; *n*, suspensory ligament of liver; *o*, left lobe of liver; *p*, gall bladder; *q*, cardiac end of stomach, and situation of spleen; *r*, pyloric end of stomach; *s*, gastro-colic omentum; *t*, transverse colon dragged downward; *u*, situation of cæcum; *v*, sigmoid flexure; *w*, omentum.

cases which he reports, only 5 or 6 were discovered during life. This fact seems rather remarkable since his report covers a period of more than two centuries. In 1643

Petrus Servius reported the first case as occurring at Rome.

Küchenmeister, up to the year 1888, collected 149 cases. The majority of these were discovered in the anatomical

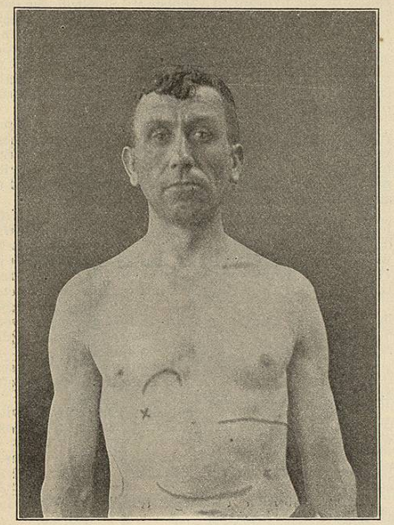

FIG. 4770.—Photograph of Schüppel's Case of Transposition of the Viscera. The X below right nipple indicates the position of the apex beat. The curved line above shows the absolute heart dulness. The straight line below the left nipple indicates the upper border of the liver dulness. The X below this line indicates the lower border of the liver dulness. The curved line above the navel indicates the greater curvature of the stomach. The curved line low down on the right side indicates the splenic dulness.

laboratory and on the post-mortem table. Pic in 1895 increased the number of reported cases to 190. Lochte up to the year 1894 collected 13 cases of partial transposition of the viscera. In more than half of these very poor descriptions were given.

An attempt to collect all the cases of situs viscerum inversus is extremely difficult and unsatisfactory, because they are reported in the literature under numerous headings. Perhaps something like 300 of these cases have been reported.

Until recent years cases of transposition of the viscera have been discovered, studied, and reported chiefly by anatomists and pathologists. Judging from my own personal experience with these cases, and from that of a large number of prominent clinicians and anatomists to whom I addressed letters of inquiry regarding their experience with transposition of the viscera, it would seem that the pendulum has swung about of late years, and that now a much larger percentage of cases of transposition is discovered by the clinician. This fact is a natural result of the much more frequent and careful physical examinations that are now being made. However, even with this improvement, all physicians know that a very small percentage of even sick people submit to careful physical examination, and that the percentage of the entire population who are thus examined is extremely small.

Since the spring of 1897 I have seen in hospital and private practice six cases of transposition of the viscera. It is rather a remarkable fact that three of these cases were seen within the short period of six months. I am also personally familiar with three other cases of situs inversus, discovered in the living subject by members of the internal medical staff of the University of Michigan, two by Dr. Warthin, and one by Dr. Cowie.

These cases have been reported in detail in the *American Journal of the Medical Sciences*. November, 1902, and in the *Vaughan Festschrift*, 1903.

In reply to my letters the following facts were gleaned: Five well-known internists and four professors of anatomy had never seen a case of transposition of the viscera. In the remaining letters 37 cases were reported. All save 6 of these were discovered during life. In this country, at least, cases of transposition are nowadays much more frequently discovered during life than after death. Note the contrast between Gruber's report and my own. Of his 79 cases only 5 or 6 were discovered during life. In my collection, which simply covers the cases reported in the letters referred to, together with those with which I am personally familiar, are 46 cases, of which 40 were discovered during life.

Method of Examination.—Careful inspection, palpation, percussion, and auscultation of the chest are of course prime essentials. The failure to find the heart apex and heart dulness on the left side most often puts one on the right track. A careful examination of the right chest may then reveal a dextrocardia. This is at once a key to the physical condition. An absence of liver dulness is then detected in the right hypochondrium. It is sought for and discovered in the left hypochondrium; the splenic dulness will then be found in the right midaxillary line.

The position and outline of the stomach may be demonstrated by inflation or by the use of the gastrodiaphane; the same is true of the sigmoid. *x*-Ray examination of the heart with the fluoroscope easily demonstrates the right-sided position of this organ. (See Fig. 4771.)

Theories Explaining the Development of Transposition.—These are chiefly of interest to the embryologist and anatomist, and will hardly be understood except by those who have devoted special study to embryology. The following are some of them.

Von Baer explains transposition by the turning of the embryo in the opposite direction; that is, the embryo normally lies on the left side of the umbilical vesicle; but if it lies on the right side, then we have transposition. According to him this occurs at the beginning of the developmental period.

Förster considers situs inversus a malformation in which the transposition of the anlagen takes place in the

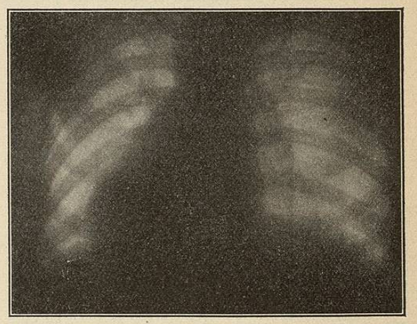

FIG. 4771.—Radiograph showing Transposition of the Heart to the Right Side. (Schüppel's case.)

first embryonal formation. In the double monster the fœtus of the right side shows a complete transposition, while the fœtus on the left side shows a normal situs.