because they are not part of a broad comprehensive scheme. Abundant illustrations might be given, but taking the latest of the remedies advanced—the routine veterinary inspection of dairy cattle—it is advocated as a thing worth introducing by itself, or to protect the milk supply, and never with a realization of the need to fit it into a wide comprehensive scheme. By itself I regard it as not worth doing, but it occupies quite a different place as part of a comprehensive attack on bovine tuberculosis.

As part of such a comprehensive scheme certain changes seem to me to be essential requirements. One is a radical alteration in the environmental conditions of the cow. There seems no reason that the agriculturists have advanced why the usual practice of keeping cows all the winter in insanitary cowsheds should not largely give place to their living under much more open-air conditions, the sheds possibly being used for milking or housing under exceptionally severe conditions.

A second step is the development of adequate measures to prevent or at least limit the spread of infection. The partial abolition of the cowshed will materially reduce risks of infection, but, in addition, more direct measures are necessary. One is a more active educational campaign. A second is to place part of the onus of preventing infection upon the cow-keeper. Since a material part of the cost of bovine tuberculosis now falls upon the central and local public health authorities, it is but logical they should have some powers to limit their expenditure by insisting that cow-owners should exercise due precautions to prevent infection. Cow-keepers who, by wilful failure to take due precautions, add to the nation's bill for tuberculosis should be penalized.

Problems of feeding and other factors affecting tuberculosis in cows all merit careful consideration in any well-thought-out programme.

Into such a scheme can profitably be fitted immunization experiments, the formation of tuberculin-free herds, the operation of a modified Tuberculosis Order, the routine veterinary inspection of cows, etc. Veterinary inspection of cows would be most valuable as part of such a scheme and might be made a most helpful procedure.

It will be noted that in any such scheme I give a prominent place to the active co-operation of the cow-owner, and regard that as essential. Any comprehensive attack on bovine tuberculosis is ultimately for the benefit of the farmer and the stock-owner. The present measures, in use or advocated, whereby a great deal of public money is spent on an attempt to diminish bovine tuberculosis without insisting on his active co-operation, are not only illogical but, in my opinion, likely to effect comparatively little. Considerable financial assistance to the farmer is necessary, since the difficulties of eradication are so considerable, and no one who appreciates these difficulties would wish to reduce the assistance or belittle its need. At the same time it is logical to ask that, as some return for that assistance, there should be a very active co-operation on the part of the stock-owner.

While such a scheme has as its primary aim and object the reduction of bovine tuberculosis, incidentally it would do a great deal to reduce the dangers of milk being infected with tubercle bacilli. This particularly applies to certain parts of it, such as routine veterinary inspection of dairy cattle, if bacteriology is adequately utilized in connexion with such inspection.

If the agricultural community decides that it is not prepared to co-operate actively (for that is what it amounts to) in the measures of the State and of local authorities to reduce the incidence of bovine tuberculosis; that, while willing to receive rate-aided assistance, tuberculosis is not of sufficient moment to agriculture to warrant the considerable disturbances to existing practice which are required, then another line of procedure is necessary. In that event I do not think it worth while, for the small measure of reduction of human tuberculosis which will accrue, to continue these partial measures, such as the Tuberculosis Order, an inadequate system of veterinary inspection, or occasional milk sampling for the tubercle bacillus. The extent of their success is not likely to be commensurate with their cost—at least, as regards the human side of the problem. It is better for those con-

cerned with the human infection side to face their own problem in their own way: to leave bovine tuberculosis to those concerned with animal diseases, and to protect the milk supply by an efficient and adequately controlled system of pasteurization. It is a confession of failure, the second best instead of the best. It has extensive drawbacks, and cannot be advocated without combination with other procedures, the aim of which is to minimize these drawbacks as far as possible.

In view of these drawbacks and other inherent objections to pasteurization, I greatly prefer the adoption of the preventive measures indicated to deal with bovine tuberculosis, but if these are not attainable, pasteurization seems less of an evil than the present tinkering procedures. Pasteurization will give a more effective protection to the milk supply than any incomplete scheme under existing conditions.

A CLINICAL STUDY OF ACUTE RHEUMATISM.

BASED ON WORK AT THE RHEUMATISM SUPERVISORY CENTRE,
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JUVENILE rheumatism is a disease characterized by its protean manifestations, its tendency to relapses, and its proneness to attack the heart. The aim of a rheumatism supervisory centre would be, were it possible, the prevention of rheumatic disease of the heart. Unfortunately the physician's hands are tied by ignorance of the exact cause of rheumatism, by possessing no specific remedy for its cure, and by having no sure or ready means for protecting the heart from its attacks. It has been said that the prevention of rheumatic heart disease can only be attained when rheumatism itself can be prevented, and, while we are not able, with our present knowledge, to prevent either rheumatism or rheumatic involvement of the heart, yet there is good reason to believe that relapses may be avoided by the employment of certain preventive measures. Put briefly, these measures consist in providing for the rheumatic child management and surroundings as near the ideal as possible, remembering that he cannot be neglected without risking exacerbations.¹ When the heart is already affected careful supervision may do much to enable the child to attain a degree of physical fitness sufficient to enable a return to a normal occupation. Thus the primary object of a rheumatism supervisory centre is twofold: the prevention of relapses and the after-care of those children whose hearts are already involved. In the latter group of children these two objects are inseparable; the best guarantee that a damaged heart will make a satisfactory recovery being to ensure that no further bouts of rheumatism occur, maintaining during the healing stage of rheumatic heart disease a careful supervision of all physical exertion.

With these principles in mind we decided that the functions of the rheumatism supervisory centre† should be: first, to make use of all the measures available for preventing relapses in rheumatic children, and, secondly, to supervise the after-care of children already the victims of rheumatic heart disease. Not directly related to either of these functions, but rather in the hope of adding something, however little it might be, to the knowledge of rheumatism, we have, by keeping careful records of the cases, been investigating juvenile rheumatism along clinical lines.

Prevention of Relapses.

The lines on which recurrences of rheumatism may best be prevented are: (1) correction of unsuitable environmental conditions; (2) attention to general health; (3)

* Working with a grant from the Medical Research Council.

† Established in connexion with the rheumatism scheme of the Royal Borough of Kensington.

treatment of diseased tonsils; (4) education of the parent in the correct management of the rheumatic child. The correction of faulty home conditions being for the most part impossible, removal of the child from its home environment to more suitable surroundings is a measure on which much reliance is placed by us and by all other workers in the field of juvenile rheumatism. But while our main attack on faulty environment has been the provision of convalescent treatment for the mild cases, and, for the severe ones, the use of certain residential institutions, let it not be forgotten that this method of temporary removal is chosen because it is the line of least resistance, and not because it appears to us to be economically sound. Apart from this temporary removal to better surroundings, something is being attempted to improve the surroundings and management of these children when they return to their homes in Kensington. The Invalid Children's Aid Association visits the homes of all rheumatic children, giving instruction and advice to the mothers. In many cases housing defects are remedied through the activities of the public health department.

Work of the Centre.

In dealing with each rheumatic child there is an important practical point for the physician to decide—namely, whether the disease is in an *active* or a *quiescent* stage. No arbitrary definition of activity has been adopted by us, each case being judged on its merits, but we have frequently experienced difficulty in deciding whether a case is to be regarded as active or not. *Active* rheumatism requires thorough and sustained treatment, and we regard it as the duty of the centre to see that proper treatment is carried out. Where the family are in a position to call in a private doctor this is the course which is recommended; otherwise the patients have been admitted to various hospitals. When the disease is found to be *quiescent* it has been our practice to re-examine the child at appropriate intervals, appointments being arranged at the centre for this purpose. Many of the quiescent cases, and certain cases of subacute rheumatism without cardiac involvement, benefit considerably by short periods of convalescence in the country or at the seaside. For some of the older children who suffer from relapsing rheumatism, or in whom there has been sufficient cardiac damage to render them unsuited to the rough and tumble of an ordinary London County Council school, we have found the special schools for physically defective children to be invaluable.

Allocation of Cases to the Rheumatic Group.

The following observations are based on a statistical study of the first 200 patients attending at the centre. In our series we have included only children in whom we were satisfied that rheumatism was, or had been, present. The difficulty in diagnosing the milder grades of rheumatism was experienced by us, as by others, and each of our cases had to be considered on its merits. There was seldom much difficulty in the diagnosis of chorea; occasionally at the first visit a mild case might be puzzling, though subsequent observations always enabled us to make a definite diagnosis. Four cases of habit spasm had to be excluded; it is of interest that all these had been notified as suffering from chorea. We came across cases of habit spasm among the rheumatic children, though not more commonly than among the ordinary out-patients of a children's hospital, and we did not regard this disorder as a symptom of rheumatism or as being related to it. Erythema nodosum was excluded because, in our opinion, this disease is not a rheumatic manifestation; others excluded were such widely differing conditions as traumatic synovitis, flat-foot, vasomotor disturbances, cyclical vomiting, and hypothyroidism. Some cases of aches and pains in the limbs were excluded, either because they had occurred on only one occasion or because the symptoms could be adequately explained on other grounds. On the other hand, we included patients in whom limb pains recurred persistently for weeks and months if no explanation other than rheumatism was forthcoming, even though no other rheumatic manifestation might be present. No doubt there are cases in our series which some would

be disinclined to regard as rheumatism. Often in cases where the diagnosis presented difficulty, help was subsequently obtained by our finding a slightly dilated heart, or a systolic bruit, or by the patient developing an obvious rheumatic exacerbation. The rest of the cases include children with more than one manifestation of rheumatism, or with one definite manifestation such as chorea or mitral stenosis. In accepting patients in whom the physical signs were the chief or only evidence of rheumatism every effort was made to exclude congenital morbus cordis.

Age and Sex.

The rheumatic scheme of the Royal Borough of Kensington concerns itself only with children under the age of 16 years. The youngest child in the series was aged 3 years and the oldest 15 years. The ages of the rheumatic

Continuous line = sexes combined. Dotted line = females only.
Broken line = males only.

children when they first presented themselves at the centre are shown in the accompanying graph.

It will be seen that the highest age peak occurs at 12 years, with lesser peaks at 6 and 8. When the sexes are plotted separately it is seen that at all ages the females preponderate (131 to 69), but the males contribute relatively more in the age group 5 to 8 and relatively less in that of 11 to 13 years.

Cardiac Involvement.

Examination of the hearts of the 200 children in the series, repeated as often as they attended the centre, showed that 35 (17.5 per cent.) had definite rheumatic heart disease; the hearts of 6 of these children appeared to get worse during the period they were under observation; one has died of malignant endocarditis. No heart in this group was observed to get appreciably better, and the majority remained unaltered. The period of observation, however—three to eighteen months—was short. In 108 (54 per cent.) of the children the heart was normal when they first presented themselves, but in 4 of these the heart subsequently became involved; a fifth child developed acute pericarditis, which cleared up, and six months later (when the child was last examined) had left no trace of heart disease. The remaining 57 children (28.5 per cent.) were placed in the category of "doubtful hearts." For the most part the physical signs in this group were those of slight or moderate dilatation, reduplication of the second mitral sound, premature systoles, and simple tachycardia—abnormal physical signs which might later disappear without leaving any trace. Subsequent observations showed that 12 patients in this group had improved and one had got worse.

The State of the Heart and Tonsillectomy.

A study of the relation between the state of the heart and tonsillectomy yielded the following data. In 115 patients who had never been subjected to tonsillectomy the heart was normal in 64, doubtful in 29, and diseased in 22. In 40 subjected to complete tonsillectomy the heart was

normal in 23, doubtful in 10, and diseased in 7. In 45 who had had incomplete tonsillectomy the heart was normal in 21, doubtful in 18, and diseased in 6. These data give no indication of the relation between the date of tonsillectomy and that of cardiac involvement; indeed, the date of the first attack on the heart can seldom be obtained with any degree of accuracy, and frequently it is quite unknown. With such a high proportion of doubtful hearts we did not feel justified in drawing conclusions from the data before us, especially as the throat operations might have been performed either before or after the cardiac damage had taken place. Leaving doubtful hearts out of account, it seems that the ratio of diseased hearts to healthy hearts in each of the three groups is approximately the same, a slight difference in favour of the operated groups being too small to be significant. One important fact may, however, be gleaned from the figures; of 85 tonsillectomized children no fewer than 45 (53 per cent.) had suffered incomplete removal of the tonsils. Now unless it be argued that incomplete removal of tonsils predisposes towards rheumatism, the results in this series, as far as the completeness of tonsillectomy is concerned, may be taken as representative of those obtained in various London institutions. Other workers have drawn attention to the high proportion of failures in tonsillectomy, and we do not propose to deal further with this question than to remark that the guillotine operation can be relied upon to give uniformly satisfactory results only in skilled and practised hands.

Onset of Rheumatism and Date of Tonsillectomy.

The relation between tonsillectomy and rheumatism in our series was further studied by ascertaining the time relation between the onset of rheumatism and the date of tonsillectomy in the group of 85 tonsillectomized children. The data are tabulated below.

	TABLE I.	Cases.
Rheumatism began before tonsillectomy ...	...	40
Rheumatism began after a complete tonsillectomy	...	10
Rheumatism began after an incomplete tonsillectomy ...	...	27
Doubtful. The history did not clearly indicate whether rheumatism preceded or followed tonsillectomy ...	...	8
		85

Though the cases are few in number it would appear that, as compared with the children with tonsillar remnants, the tonsillectomized children have a relatively small liability to contract rheumatic infection.

Rheumatism following Tonsillectomy.

Dr. Reginald Miller² has suggested that although tonsillectomy does not prevent rheumatism, it modifies its virulence, making the appearance of heart disease uncommon in tonsillectomized children. The figures just cited show that in our series there were 37 children in whom rheumatism began after partial or complete tonsillectomy. We analysed the rheumatic manifestations occurring in these children, and the figures we obtained lend support to Dr. Miller's view.

TABLE II.—Tonsillectomy before Onset of Rheumatism.

	Complete.	Incomplete.
Pains only ...	5	14
Chorea only ...	1	0
Pains and chorea ...	2	1
Pains and/or chorea with heart disease ...	2	12
	10	27

It is significant that in our series of 200 rheumatic children—of whom 40 had been subjected to complete and 45 to incomplete tonsillectomy—only two children could be shown to have developed heart disease after complete tonsillectomy.

Dental Caries and Constipation.

Observations on the presence of dental caries were made in 154 cases; of these, no carious teeth were present in 97; one carious tooth each in 29; two carious teeth each in 9; three or more carious teeth each in 19. For comparison we

may refer to Dr. Livingston's report³ on the Michael Faraday School (Walworth). In 1927 he found that only 21.5 per cent. of the children were completely free from dental caries. The figures of the School Medical Service⁴ showed that among 2,213,721 children inspected the incidence of dental disease was 63.9 per cent. We have formed the opinion that the teeth of the rheumatic children in our series compare favourably with those of children seen in the out-patient departments of children's hospitals. Other workers on rheumatism have arrived at a similar conclusion, and there seems to be no evidence of an association between rheumatism and dental caries.

The rheumatic child has been described as a constipated child. With a view to clearing our minds on this subject we took notes of 152 cases, and found that constipation was relatively infrequent, occurring in only 17 children (11 per cent.).

Cardiac Irregularities.

All the cardiac irregularities noted fell into one or other of two groups: (1) sinus arrhythmia; (2) premature beats.

Sinus Arrhythmia.—The observations on sinus arrhythmia were made with the patient in the prone position. The effect of deep breathing on the arrhythmia was always noted before the presence or absence of sinus arrhythmia was recorded; 87 children were examined, sinus arrhythmia being present in 66 (76 per cent.) and absent in 21 (24 per cent.). Of those in whom sinus arrhythmia was present, 16 (24.2 per cent.) were classified as cases of active rheumatism, while of those in whom it was absent 10 (47.6 per cent.) were so classified. Sinus arrhythmia may be present or absent in children with active or quiescent rheumatism, just as it may be present or absent in healthy children. Our observations suggest, however, that though marked sinus arrhythmia is the rule in chorea (always classified as active rheumatism in our series) it is more often absent in the active rheumatic cases than in the quiescent ones. Active rheumatism is usually associated with a rise of pulse rate, and the fact that tachycardia tends to banish sinus arrhythmia probably accounts for its relative infrequency in active rheumatism. The presence of exaggerated sinus arrhythmia in the rapid heart of chorea is interesting; it may be connected in some way with the sympathetic and vagal disturbances of the condition.

Premature Beats.—Although we were on the look-out for this irregularity we found it in only 3 cases (1.5 per cent.). Extra-systoles are uncommon in the hearts of rheumatic children; in the normal child they are even more rare. We regard them as an indication of inflammatory (or possibly toxic) involvement of the myocardium. Details of the three cases are as follows:

Case 1.—A girl, aged 13, was seen in a first attack of chorea, and admitted to Princess Louise Hospital for Children. Pain had occurred in various joints for two weeks before admission. When the patient was first examined premature beats were occurring frequently and considerably upsetting the cardiac rhythm; a well-marked sinus arrhythmia further complicated the rhythm. During her stay of two months in hospital premature beats were usually to be heard, and were not banished when she held her breath. On her discharge to a convalescent home a localized mitral systolic bruit was to be heard. After eight months the extra-systoles and the systolic bruit were still present.

Case 2.—A boy, aged 11, had developed rheumatism at the age of 6, and chorea at 9½. At the first examination there was no evidence of heart disease, but later extra-systoles were usually to be heard. He has been observed for a period of fifteen months and extra-systoles are still occurring. No other manifestation of cardiac involvement has appeared, but rheumatic pains continue.

Case 3.—A girl, aged 7½, developed rheumatism at the age of 4 years. When first examined she had a gross cardiac irregularity, due to frequent extra-systoles. There was a mitral systolic bruit. An electro-cardiogram confirmed the clinical findings, and showed that the premature beats were arising in the auricle. After three months' observation coupled beating, due to extra-systoles, was heard. Two weeks later this observation was repeated. Some five months later the following was recorded: "Frequent premature beats—often coupled beating for about twenty beats at a time. Premature beats present when breath is held in full inspiration." After a total observation period of over sixteen months the extra-systoles are still occurring and the mitral murmur persists.

Rheumatic Tachycardia.—A high pulse rate is the rule in active rheumatic infection; some rheumatic children, however, show a degree of tachycardia which is out of

proportion to the severity of their affection, and fall into a clinical group called "rheumatic tachycardia." There were 6 (3 per cent.) such cases in our series. Their characteristic symptom is sustained rapidity of the heart, which is not affected to any extent by treatment, whether this be rest in the prone position, sedatives, salicylates, or digitalis. It is possible that the tachycardia is less an indication of myocardial involvement than of a derangement of the nervous control of the sino-auricular node, for we have been surprised at the unexpectedly benign course of these cases, and, unless there is evidence of valvular or myocardial damage apart from the tachycardia, we take an optimistic view about them. Subsequent damage to the valves has not occurred in our cases during the period they have been under our care, but further observation will be maintained.

Incidence of Exanthemata.

There was a history of the various exanthemata in approximately the expected proportion of the children. Measles, the most frequent, had occurred in 88 per cent. of 189 children; diphtheria (16 per cent. of 190), and scarlet fever (15 per cent. of 189) were the least frequent. A history of rheumatism beginning after attacks of measles, diphtheria, and scarlet fever was obtained in various cases, and though it is possible that in a disease as common as rheumatism coincidence may be a sufficient explanation, the debilitating effect of the exanthemata must not be overlooked.

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THE SURGERY OF ACCESS TO THE PLEURAL CAVITY.

WITH ILLUSTRATIVE CASES.

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THE three cases in this paper are reported in order to show that the pleural cavity of one side may be freely opened with impunity under the ordinary arrangements of general anaesthesia. The opening made is large enough to see and feel the whole of the contents easily. This is not a new observation; I learned the lesson in the war whilst removing shrapnel and bullets from the lung. Those patients were all young men, and it was usually possible to reflect and subsequently replace a rib. Two of the patients whose cases are reported here were over 60; their ribs were brittle and were removed, as they fractured during the process of elevation. I was not sure what would be the effect on the circulation and respiration of widely opening the pleura at this age; apparently this was no more disturbing than in the younger men, and that is to say nothing beyond a little quickening of both pulse and respiration, which gave rise to no anxiety whatever. There were no adhesions to separate, and so no bleeding, and there was no infection. It was a combination of these two things in the war cases which sometimes caused the development of an empyema, for the foreign body was almost always infected in some degree, and adhesions were cohesions and extensive.

Surgery has still to find its legitimate place in dealing with conditions in the chest. Widely opening the pleura in the presence of a suppurative lesion in the lung is often made difficult by adhesions, and must of necessity put the patient to the grave risk of an empyema. In some degree in such an operation as lobectomy—for example, in carcinoma of the lung—the same risk is run by infection from the bronchi. At the best it is only rarely, and then in specially selected cases, that this line of treatment is possible, though experience may show us that the present limitations may be exceeded. However, it is as a means of access for radium applications that I wish particularly to use these three cases as illustrations. It may happen from time to time that a radium needle inserted for

carcinoma of the breast will work through into the chest, as happened in the third of these three cases, and it is comforting to know that it may be recovered without any undue risk to the patient; but the radium applications to which I particularly want to allude are in cases of primary carcinoma within the chest, and especially of the lung.

I have seen no reports of any work being done on these lines, but it seems to me well worth giving the method a trial when the opportunity arises. The large opening in the pleura with its attendant complete collapse of the lung—so dreaded in the past—would be a great advantage, for it would enable the growth to be palpated with ease, and the access afforded would allow of the application of the radium needles with precision. Adhesions, if present in this disease, are not particularly baffling, and so the separation of them would be unlikely to be attended with troublesome haemorrhage, and the risk of infection would only be that of any other "clean" operation. It is up to the physicians, who see these cases, to take the initiative: a reasonable proposition of this kind should be welcomed by them, for the mortality at present is 100 per cent.

CASE I.

The patient was a man, aged 65. A lump had been noticed on the chest wall of the right side for six months. During this time it had steadily increased in size. There was no pain. He was seen by me in April, 1928, when the tumour was about the size of a duck's egg and fixed to the sixth rib in the anterior axillary line. The tumour was hard, rather elastic, and nodular. No abnormal signs were detected in the chest. A diagnosis of chondromyxosarcoma was made. On April 18th, 1928, the tumour was exposed and found fixed to the sixth rib; this bone was divided an inch beyond the growth at both ends, and it was then found that there was a mass projecting into the pleural cavity, covered with pleura, of course, but intimately adherent to it. The mass of growth on the inner side of the chest wall was slightly larger than the part projecting beneath the skin. The pleura was opened and the adherent part cut away with the growth. On opening the pleura the lung collapsed at once and completely, but this did not appear to inconvenience the patient in the least. After removing the piece of rib with the growth and adherent pleura a hole in the pleura was left through which one's hand could pass easily, and it was found impossible to close the gap except by drawing together the split pectoral muscles.

The patient made a perfectly smooth recovery, and within a week the lung appeared to be fully expanded. Sixteen months later the patient does not present any evidence of local recurrence.

Microscopic examination of the tumour proved it to be a chondromyxosarcoma of very malignant aspect, showing numerous mitotic figures and great irregularity of cell structure.

CASE II.

A woman, aged 63, who had had her right breast removed for carcinoma—verified by histology—noticed, five years later, a small nodule over the sterno-clavicular joint region, which gradually increased in size. There was very little pain. She was seen by me in May, 1928. There was a hard, ill-defined tumour at the inner end of the first intercostal space on the right side; this was obviously a recurrence, and was firmly fixed to the bone. There was no cough or other sign to suggest intrathoracic extension.

On May 6th, 1928, I removed a part of the clavicle and the inner ends of the first and second ribs, together with the growth, which was adherent to the pleura; extending outwards from the adherent part a few plaques of hard growth were seen reaching away to about one inch beyond the point of adhesion. The pleural cavity was opened and the involved pleura removed with the rest of the growth. The lung collapsed, causing no obvious inconvenience to the patient, and she made an uninterrupted recovery. There was no evidence of recurrence a year later. Histologically the tumour was proved to be carcinoma.

CASE III.

A woman, aged 46, was admitted to hospital recently with carcinoma of the left breast, which was treated with radium needles. One of these, which had been inserted into the third intercostal space, worked through into the pleural cavity, and could not be recovered by the use of a pair of forceps. She was not a patient of mine, but I was asked to help to recover the needle. Under the x rays it was seen to move with the lung, under the inner end of the third rib, and could be touched with the forceps but not held. After some considerable time spent in these efforts I decided that the only way to extract the needle was to open the chest. This was done, the lung of course collapsing, and with it the needle, which was found to have fallen into the costo-phrenic sulcus, and was picked up from there by the fingers after inserting my hand into the pleural cavity. The