OBSERVATIONS ON AN UNIQUE EPIDEMIC OF OTITIS MEDIA IN BOYS.

By

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H.M.S. "GANGES", SHOTLEY

January 1933 to June 1934.

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With regard to the Regulations for the Degree of Doctor of Medicine, Page 4; Section XXll; Para:3. footnote the author wishes it to be known that no part of this thesis can be published without Admiralty permission.

I have to thank Surgeon Rear-Admiral H.R.H. Denny and Surgeon-Lieutenant Commander C.B. Nicholson for their courtesy in allowing me to abstract certain information from the bed tickets of patients sent to the Royal Naval Hospital, Chatham.

"Certainly the percentage of severe ear infections has recently been greater and in consequence the mortality of the "acute ear" higher. Any little contribution to our knowledge of the subject must therefore be of value!"

I. PRELIMINARY REMARKS.

The boys referred to in the title are the recruits for the seaman and signalman branches of the Royal Navy; and a short account of the method of entry, the situation of the Training Establishment and the medical arrangements for their bodily welfare will help to illumine the thesis, part of which was written as an article for the Royal Naval Medical Journal. It has been deemed advisable not to interfere too much with the original text, as the statistics are drawn from a naval establishment and the terminology should more or less conform to service custom.

H.M.S. "Ganges".

The Royal Naval Training Establishment at Shotley, Suffolk, is called H.M.S. "Ganges" in accordance with the usual practice of calling all Naval Establishments H.M.S."--" even if shore ones, e.g. The Admiralty itself is called H.M.S. "President". Originally boys were trained in old hulks, but this was found to be unhygienic and uneconomic and the last of the old training ships was done away with a few years ago. H.M.S. "Ganges" was built in 1905 and

for close on thirty years has been the chief training centre for the future seamen and signalmen of the Royal Navy. The vast majority of the boys are entered when fifteen; and after a period varying from nine to fifteen months are drafted to ships. The signal branch takes longest to train. It is noteworthy that in 1933 and 1934 recruitment has been much larger than usual and in certain instances the period of training for the seamen class has been cut down to about eight months, the boys being drafted to barracks to await employment at sea.

Situation.

The Training Establishment is situated at the tip of a peninsula on the East Coast rejoicing in the name of "Bloody Point". To the south is the river Stour with the port of Harwich just across the water; to the north is the river Orwell on which stands Ipswich some ten miles away; about two miles to the eastward lies the North Sea and the entrance to Harwich Harbour guarded by Landguard Point.

Climate.

The climate is dry and healthy but rigorous especially in the winter when a large incidence of sickness is always to be expected amongst the boys. The process of "hardening up" even amongst a physically select portion of the youth of the country, entails casualties. The boys are out and about in all weathers, boat sailing being most important, and it is continued all winter. Time is short;

and the opportunity of inculcating judgment, initiative and power of command which boat sailing certainly gives must be seized whilst the opportunity offers.

Method of Entry into the Royal Navy.

There are various recruiting offices scattered throughout the country, to which application is made for entry. The standard is now high, and includes an educational as well as a physical examination. The latter is carried out by a doctor attached to the recruiting office and he is frequently a retired naval medical officer. Local boys and boys from the Naval Hospital School are examined at Shotley. This school, previously at Greenwich, and now at Holbrook, a village a few miles away, is for the sons of naval ratings and is run under Admiralty supervision.

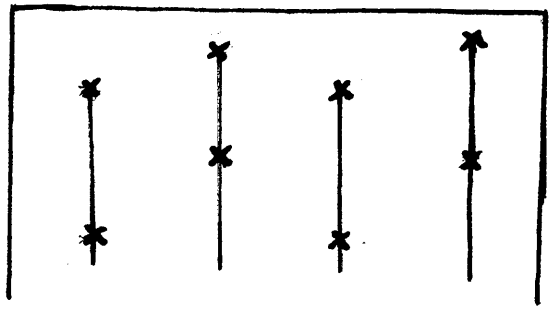
"New Entries."

The "new entries" are kept apart for the first month during which time they are sorted out into "advance class" and "general class" boys. Many of the former go in for the signal branch, which requires a large measure of intelligence. After this interval the new entries join up with the main establishment, being sent to different divisions, the subunit of which is a "mess".

The Main Establishment.

The Establishment is more or less a school, but with the boys approximately of the same age. There are various schools - educational, gunnery, signal, etc. and

the other buildings include a gymnasium, indoor swimming bath, reading room, chapel etc. As regards the actual accommodation for living and sleeping, the boys are broken up into units of approximately fifty and each unit occupies a "mess" or dormitory. Most of the messes are bungalow in type, giving onto a long covered way, which provides shelter between the dormitories, the galley or cookhouse, and the bathroom which is fitted with sprays. Entering a mess, one comes first on the wash places and lavatories giving off from a short passage way; then a vacant space where the boys have their meals distributed from a central galley: immediately beyond are their beds so arranged as to give six feet of clearance between "heads" and about three feet of clearance between beds. The beds are in four rows, and if the mess contains 44 boys or more, the vacant eating space or mess deck, which incidentally is covered with concrete, is also used for sleeping at night, the beds being "staggered" to increase the distance between heads.



The scale drawing gives a very clear idea of the living accommodation of the boys. (ENCLOSED)

The Royal Naval Sick Quarters.

The Sick Quarters are immediately adjacent to the Training Establishment, where all the medical work is done. About 160 beds are available, including a Zymotic section for infectious cases. In the winter and spring terms the Sick Quarters have been very full for the past two years; on occasion the boys' dormitories have had to be used for the overflow in an Influenza epidemic. There is a small laboratory where essential work can be done.

The doctors consist of a Surgeon Captain in charge for administrative duties, and two others, one surgical and one medical. The division, however, is a very rough one, and whoever happens to be on duty has to cope with any work which arises. Cases requiring specialist treatment are sent by ambulance to the Royal Naval Hospital, Chatham, over eighty miles away. Hence in acute middle ear disease complications have to be diagnosed early to give sufficient time for removal and operation. Similar conditions prevail at sea; and the article was originally written in the hope that it might be of assistance to medical officers afloat who are frequently in charge of large numbers of boys who have been drafted from H.M.S. "Ganges".

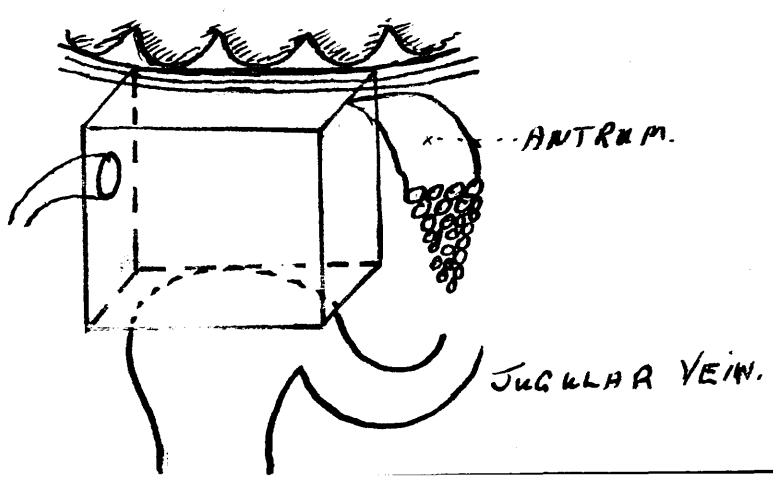
II. INTRODUCTION.

Since the beginning of 1933 there has been a large increase in the number of cases of acute middle ear disease, and with it the frequent complication mastoiditis, which if not treated in time may cause the death of the patient, owing to its unfortunate sequelae. Amongst the boys at Shotley resisting power is lower than at a later age; but as the cases are seen early, the opportunity arises for immediate treatment in the hope that complications may be avoided. If the latter do arise then early diagnosis is essential to allow transportation to the Royal Naval Hospital, Chatham, eighty miles away. This thesis accordingly deals with what has been and still is an epidemic of Acute Otitis Media, the etiology, the early diagnosis and treatment, and the resulting conclusions.

III. BRIEF ANATOMICAL DESCRIPTION OF THE MIDDLE EAR, THE TYMPANIC ANTRUM AND THEIR RELATIONS.

For the purposes of this article only a brief resumé of the anatomy of the middle ear and the temporal bone is required, so that stress can be laid on certain points.

[2]



The Middle Ear is a narrow cleftlike space in the temporal bone, measuring about half an inch from above downwards and from behind forwards, being very narrow from side to side. It can be divided conveniently into two parts - the tympanic cavity proper which lies on the inner side of the tympanic membrane, and the attic which lies above the level of the drumhead and leads by the aditus to the mastoid antrum.

The diagram above shows six walls. On the anterior wall is the entrance of the Eustachian tube from the naso-pharynx: on the posterior wall in its upper part is the triangular shaped aditus leading to the antrum. The roof or tegmen tympani is a thin plate of bone separating the middle fossa of the skull from the middle ear: the floor separates the cavity from the Internal Jugular Vein and Carotid Artery; the external wall is composed of the drum-head and above it the lateral wall of the attic; the inner wall lies between the middle and internal ears and exhibits two openings (1) the fenestra ovalis for the footpiece of the stapes and (2) the fenestra rotunda.

On the inner wall and floor of the aditus there is a prominence due to the lateral semicircular canal. The floor of the aditus is higher than that of the tympanic antrum. Actually the tympanic cavity contains only air as the ossicles, muscles and nerves are covered by mucous membrane and therefore lie outside.

The Tympanic Antrum situate in the mastoid bone lies beneath MacEwen's triangle, the definition of which is well known to all Glasgow graduates. This antrum is present from birth onwards, and the mastoid process is hollowed out by air cells which spread outwards, backwards and downwards from it. From the diagnostic point of view the so-called "border" cells are of importance. They are situated in the posterior wall of the bony meatus in its upper part and in middle ear disease may cause sagging downwards of the lining membrane of the external meatus in its inner and upper part. The roof or tegmen antri is a continuation of the tegmen tympani, whilst behind the antrum is the descending portion of the lateral sinus.

The Temporal Bone developmentally consists of three parts - the squamous, tympanic and petrosal - the two former being formed in membrane and the latter in cartilage. They are ossified at an early age but the bone must remain quite soft in the "teens". In babies one scoop with a Volkmann's spoon is enough to remove the outer plate of the mastoid process. Part of the line of union of the squamous and petrosal portions lies in the antrum itself and thus the air cells are divided into two groups - (1) the squamo-mastoid and (2) the petro-mastoid. The first group includes the cells in the anterior, lateral and inferior parts of the process, the latter those in the posterior, internal and superior portions. The antrum itself is formed from both groups

and sometimes shows a ridge indicating the line of division. Here may be a possible weakness in younger people.

The Vessels of the Tympanic Cavity are numerous, branches coming from the adjacent arteries. The veins of the Tympanic Cavity enter the Pterygoid Plexus, the middle meningeal veins, the jugular bulb, the superior petrosal sinus and carotid venous plexus. The lymphatics drain into the retro-pharyngeal and parotid lymph glands.

On the inner wall of the tympanic antrum is a series of small veins, the remains of the foetal Vena Subarcuata, which pass inwards to reach the posterior surface of the petrous pyramid and there to open into the superior petrosal sinus. Infection may pass along this route and give rise to meningitis.

Summary.

There are two obvious lines of infection from outside to the middle ear -

(1) via the drumhead - usually traumatic and an infrequent occurrence.

(2) via the Eustachian tube from infections of the nose and throat - the so-called minor Respiratory Diseases and some of the Zymotic group.

The middle ear having become infected, spread to the antrum is simple as the mucous membrane of the two cavities is continuous. Should drainage become inadequate then there is possible spread to the mastoid cells, to the

venous sinuses, and to the meninges and brain, not forgetting direct spread through the bone as evidenced by the case quoted by Gray[3].

Another route is by the round and oval windows to the labyrinth and by the nerve sheaths (Cviii) to the brain.

IV. STATISTICS.

The following statistics show the state of affairs at Shotley during my previous commission here (1928 and 6 months in 1929) and during my present one (1933 and 6 months in 1934). I have been unable to obtain additional data elsewhere; I know however that in Ipswich the incidence of middle ear disease and its complications has been higher than usual, and the Ear, Nose and Throat specialist exceptionally busy during the past eighteen months, and more especially during the past six months.

The figures in the adjacent table refer only to boys admitted into the Sick Quarters: they moreover do not include any re-admissions for chronic otitis media or other ear disease. The figures for mastoiditis and chronic otitis media are not included in the figures for uncomplicated Otitis Media.

Examination of the table shows:-

(1) The great increase in the incidence of all types of ear disease between 1928 and 1933.

(2) That middle ear disease has increased relatively to a greater extent than external ear disease.

Period	No.of Boys		Otitis Externa	Acute Otitis Media	Chronic Otitis Media	Mastoiditis	Total Cases
1928	1130	No.of Cases	8	3	5	1	17
		Yearly rate per 1000	7.1	2.7	4.4	0.9	15.1
Jan.-June	1096	No.of Cases	10	1	2	-	13
1929		Yearly rate per 1000	9.1	0.9	1.9		11.9
1933		No.of Cases	44	38	7	10	99
	1513	Yearly rate per 1000	29.0	25.1	4.6	6.6	65.4
Jan.-June	1683	No.of Cases	20	45	4	11	80
1934		Yearly rate per 1000	23.6	53.5	4.8	13.1	95.0

Note: The total cases 99 for the year 1933 do not correspond with the official figure of 101 as I have excluded two cases -- one of polypus and one remaining from last return.

(3) Roughly the complication mastoiditis occurred in 20 per cent of all cases in all periods.

The figures for the half year January to June 1934 indicate that a much higher prevalence of middle ear disease will be recorded than in 1933, since the numbers already exceed the total for that year. Moreover cases are steadily coming into my ward despite the fine summer weather.

The table refers to the boys under training only; it is interesting to note the relative freedom of the "ship's company", (i.e. instructors, seamen, cooks, marines and other trained men). In 1928 there was only one case of acute Otitis Media among 392 men; in the first half of 1929 one case of chronic Otitis Media among 411 men. In 1933 there were three cases of acute Otitis Media and one of Otitis Externa among 397 men who formed the "ship's company". So far in 1934 no trained man has "gone sick" with ear trouble.

V. ETIOLOGY.

The vast majority of cases of acute Otitis Media are secondary to some infection of the naso-pharynx or tonsils, about the only exceptions being trauma, an infrequent occurrence, and swimming directly or indirectly. Although the text books stress the importance of the zymotic group of diseases as the primary source of middle ear infection, nevertheless, in the Navy at any rate, the

latter diseases are almost negligible in comparison with tonsillitis and influenza which account for at least 90% of acute Otitis Media. Of the cases recorded only three were sequelae of Scarlet Fever and one trauma.

Glover[4] and others have produced a mass of evidence which shows that in overcrowded school dormitories and infirmary wards, ear and other complications of influenza, tonsillitis etc. were much more prone to occur and spread from case to case.

Naval sick records also help to prove this. H.M.S. "Impregnable" was one of the old training ships referred to in the Preliminary Remarks and these records show that in the period 1921-1927 there was nearly twice as much of all kinds of infectious disease in "Impregnable" as in "Ganges". Similarly the average yearly rate for diseases of the ear was 44 per thousand in the former as against 25 per thousand in the latter.

Yet the class, age, nutrition, employment and period of training were the same in both establishments and it is morally certain that the factor accounting for the higher incidence of infections and ear diseases was the close accommodation of the "Impregnable" boys. The latter slept in hammocks, practically cheek by jowl.

As regards evidence of the etiology of middle ear disease, the table gives the yearly incidence per 1,000 boys in H.M.S. "Ganges" from 1922 to 1933 for those cases entered in the records as Tonsillitis, Catarrh and

R.N. TRAINING ESTABLISHMENT H.M.S."GANGES".

Incidence per 1000 average yearly strength of boys

Minor Respiratory and Ear Infections with Rheumatism.

YEAR	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Catarrh	78	248	88	137	123	144	178	178	169	324	222	115
Influenza	65	6	234	2	205	254	6	130	1	5	5	155
Tonsillitis	56	116	144	159	269	244	193	130	144	264	188	275
Total M.R.I.	199	370	466	298	597	642	377	438	314	593	415	545
Otitis Media	2.4	7.4	8.8	?*	11.2	12.4	8.2	5.6	25.0	20.6	14.0	37
" Externa	3.6	12.4	13.8	?*	12.8	9.1	3.7	11.8	4.2	2.1	3.0	29.7
Total Ear	6.4	19.8	22.6	35.5	24.0	21.5	11.9	17.4	29.2	22.7	17.0	66.7
Rheumatism	6.6	2.5	5.1	14.9	14.2	19.4	7.3	14.9	9.7	3.1	15.0	17.1
Yearly Strength	1670	1210	1810	1950	1960	1650	1090	1070	720	970	997	1513

* In year 1925 the sick records show only entries for "otitis media" and no "externa". This appears as if these entities were not entered separately in that year.

Influenza. Practically, owing to the fancy of the physician or prevailing custom, these entries badly overlap. For example, 1931 was a bad influenza year, but for reasons of policy, the influenza of this year was called "epidemic Catarrh" and catarrh increases to double that of 1930 as the result of the epidemic influenza. This difficulty in the record keeping can be got over by adding these diagnoses together and forming a group of minor Respiratory Infection (M.R.I.) which produces a fairly comparative index of tonsillitis etc. from year to year.

Similarly it must be confessed one is rather doubtful how far Otitis Media and Otitis Externa have been properly distinguished in the records. For example in 1925 they were lumped together with the combined incidence of 35.5 per 1,000 for all diseases of the ear. (Further investigation shows them all to have been called Otitis Media which is certainly questionable). In 1930 and 1931 it is hard to believe that the ratio of Media to Externa was really as high as recorded.

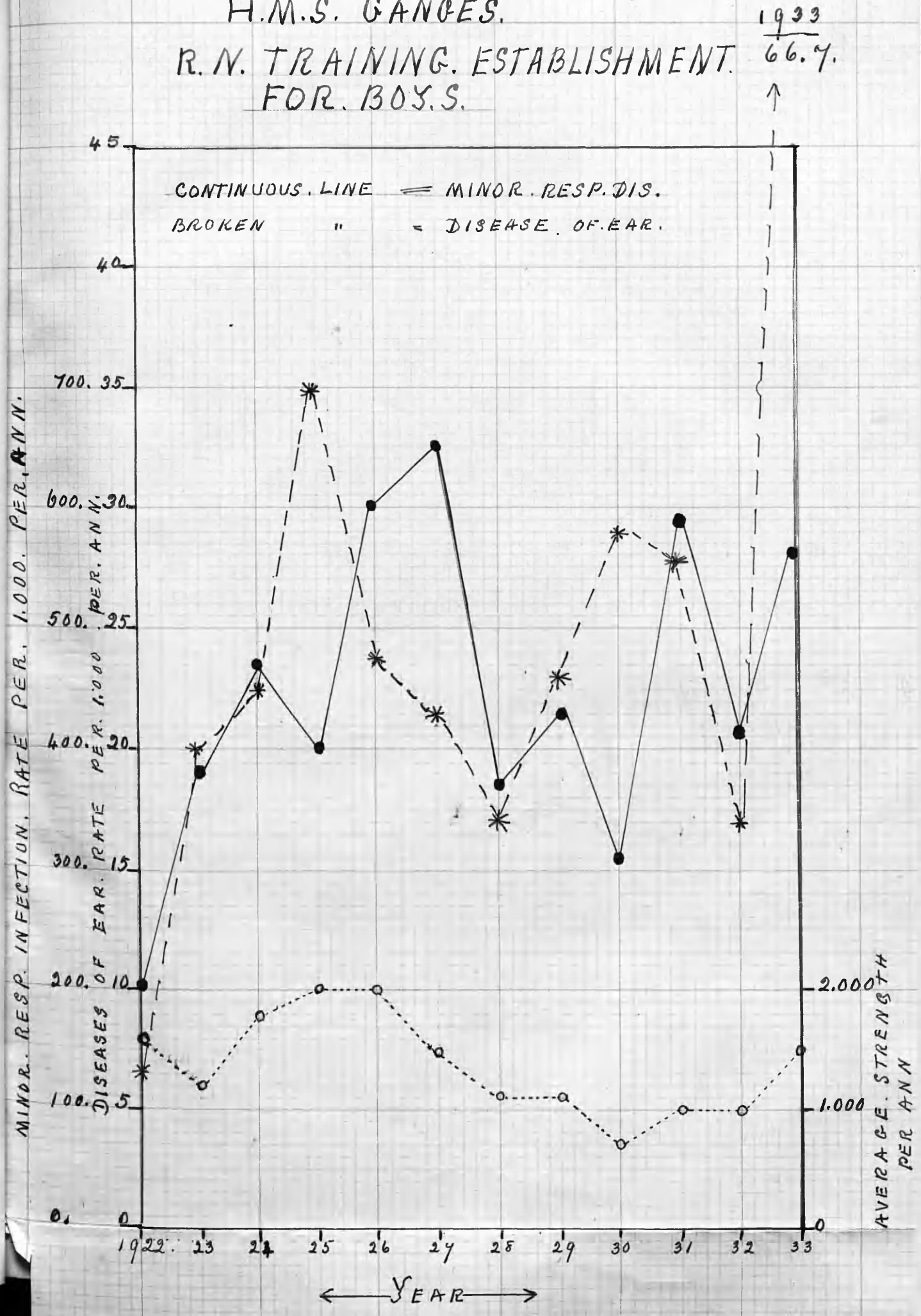
But again if we add the incidence of eaf diseases together the total probably gives a fairly accurate comparison of the relative amount of ear infection from year to year.

At first sight there appears in the table to be little association between the prevalence of M.R.I. and "ears". To a great extent this may be due to the fact that the number of "ears" per annum is often too small to

DIAGRAM

H.M.S. GANGES.

R.N. TRAINING. ESTABLISHMENT. FOR. BOYS.



GRAPHS. OF. RELATIVE. YEARLY. INCIDENCE.
OF EAR AND MINOR RESPIRATORY INFECTION.

NOTE, THE. GREAT. EPIDEMIC. OF EAR. DISEASE. WHICH BEGAN IN 1933. AND HAS. CONTINUED INTO 1934

have much statistical significance. If however we plot out the incidence of M.R.I. and total "ears" as in the diagram, there is a rough parallelism that, taken as a whole, the incidence of M.R.I. and Ear disease tend to vary together.

In this diagram there is frankly little evidence of the effect of the rate of recruiting on M.R.I. and Otitis Media as indicated in the bottom graph giving the average yearly strength. But larger scale figures and much other evidence show that the rate of recruiting is a factor of great importance in the increase of M.R.I.[5] and therefore secondarily the morbidity for ear trouble. The incidence of all disease in the services falls most heavily on the recruits.[6] This is not so marked in the Naval Training Establishments themselves where the boys remain only about a year on an average and where of 794 consecutive cases of M.R.I. at Shotley 451 or 56 per cent occurred in the first six months of training. In another service establishment where the boys stop three years under training, of 806 consecutive cases of M.R.I. 449 or 56 per cent occurred in the first year, 250 or 31 per cent in the second year, and only 107 or 13 per cent in the last year of training.

Similarly at Shotley from 1922 to 1928 there was an average of 504 trained men (i.e. cooks, instructors, marines, seamen etc.) who produced 63 cases of "tonsillitis", i.e. a rate of 18 per 1,000 per annum.

During the same period the trainees produced 1909 cases of Tonsillitis, average strength was 1606 giving an annual rate of 171 per 1,000 per annum.

But the great prevalence of ear trouble among naval recruits is perhaps best brought out by the fact that during the seven years 1921 to 1927, the incidence of "diseases of the ear" at Shotley was 25, as mentioned above, as against 3.9 in the Atlantic Fleet. Therefore although the trained men lived under much more crowded conditions in ships yet they suffered less than a sixth the incidence of ear disease exhibited by trainees in their first year of entry.

But the variability of disease also protrudes itself into the argument of overcrowding as a chief cause of spread of M.R.I. and Otitis Media, even though at Shotley the boys had increased from 1,130 to 1660- or nearly 50 per cent and the number in each mess by about 20% and the period of training shortened. For not only at Shotley but throughout the Navy during the year 1933 there has been a great exacerbation of Otitis Media as a complication of Respiratory and Zymotic Infection. Again from what one hears this is also the case outside the Service. Incidentally it would seem there is a special strain of haemolytic streptococcus pervading the country with a special tendency to select the middle ear. One may also remark that this organism not only causes middle

ear disease but other complications[7] among which pseudo-scarlatina rashes, joint pains (sometimes definite arthritis), pericarditis and endocarditis have been more prevalent sequelae than usual of the M.R.I. seen in the Navy. The character of the cases admitted to Royal Naval Hospital, Chatham, this year strongly suggests the large incidence of ear disease must be as much or more due to a change in the characters of the predominant organisms as to environmental conditions (i.e. population, density, weather, food) or to changes in the immunity reactions of the population at risk. Such an hypothesis is supported by analogy with groups of organisms. Much recent work for example has shown how change in the clinical type of Diphtheria in certain parts of England has been in association with a change in the type of the diphtheria bacillus.[8]

VI. ACUTE OTITIS EXTERNA.

Before introducing the subject of acute middle ear disease it is advisable to say a few words about acute Otitis Externa as it may cause trouble in diagnosis and is itself a frequent complication of Otitis Media.

A. Furunculosis. The history may be of no great importance. There is pain often severe and some deafness usually less than in acute Otitis Media. But if there is no history of cold or sore throat this is a point in favour of Otitis Externa. Pain on eating is frequently present.

Army Form B. 181
Naval Form M. 41
R.A.F. Form 549

CLINICAL CHART.

(*To be attached to Case Sheet.*).

Unit or Ship ____________

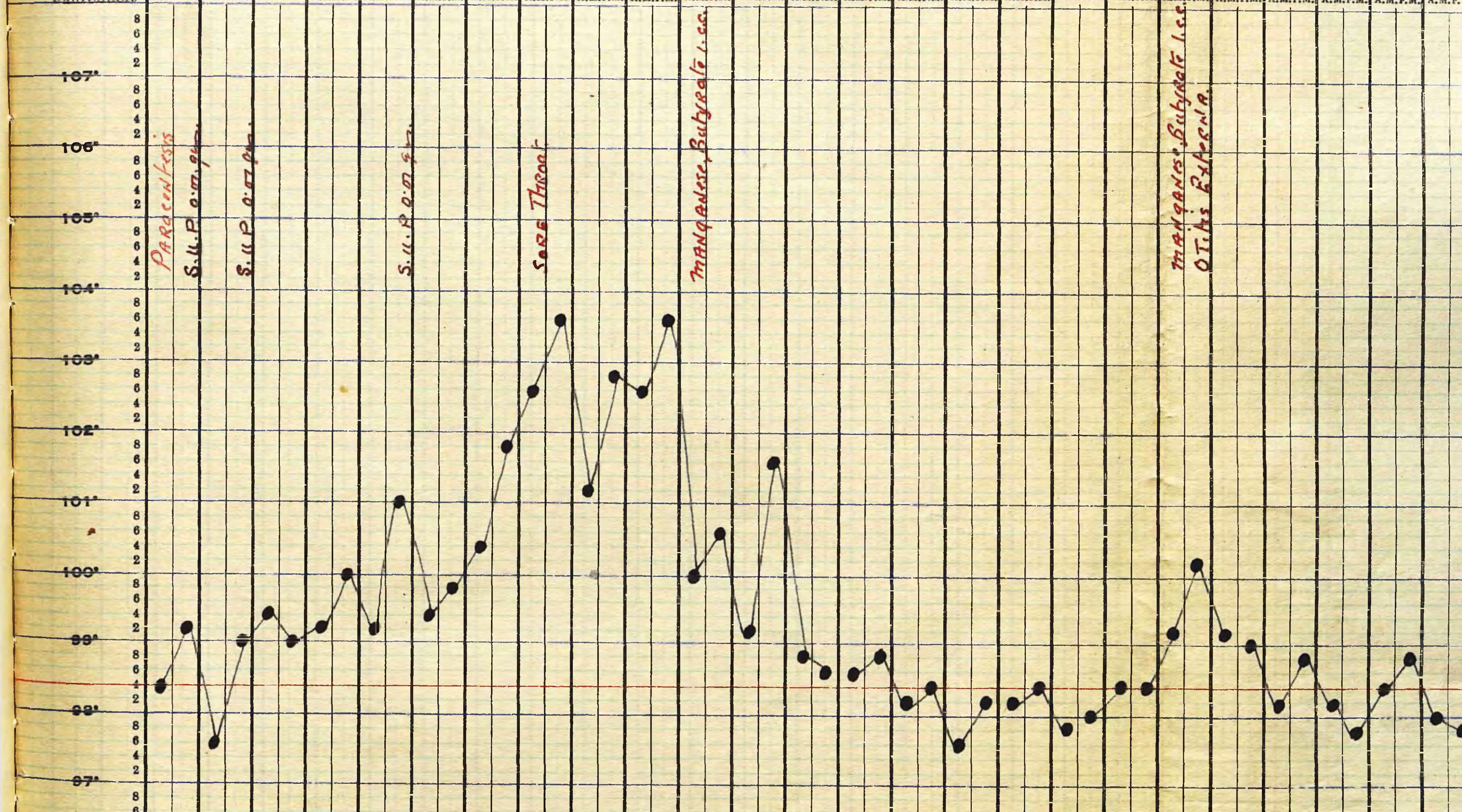
Official No. ____________

Hospital ____________

Disease ____ JAN: ____ *Rank or Rating and Name* ____________ *Age* ______ *Service* ______

Dates of Observation	Days of Disease	Pulse per Minute (A.M.)	Pulse per Minute (P.M.)	Respirations per Minute	Motions per 24 Hours
24			78		/ /
25	1	58	64		/ /
26	2	60	60		/ /
27	3	60	70		/ /
28	4	72	96		/ /
29	5	76	72		/ /
30	6	66	74		/ /
31	7	92	94		/ /
1	8	66	80		/ /
2	9	68	82		/ /
3	10	74	98		/ /
4	11	64	64		/ /
5	12	64	60		/ /
6	13	60	60		/ /
7	14	64	66		/ /
8	15	52	60		/ /
9	16	60	70		/ /
10	17	90	54		/ /
11	18	52	60		/ /
12	19	52	60		/ /
13	20	68	68		/ /
14	21	60	65		/ /
15	22	64	60		/ /
16	23	56	60		/ /
17	24	60	60		/ /

Temperature, Fahrenheit — Time A.M. P.M.



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Signature ____________

Army Form B. 181
Naval Form M. 41
R.A.F. Form 549

CLINICAL CHART.

(*To be attached to Case Sheet.*).

Unit or Ship _____ *Hospital* _____

Official No. _____

Disease Feb. *Rank or Rating and Name* _____ *Age* _____ *Service* _____

Dates of Observation	18		19		20		21.																								
Days of Disease	25		26.		27		28																								
Temperature, Fahrenheit	Time A.M.	P.M.	Time A.M.	P.M.	Time A.M.	P.M.	Time A.M.	P.M.	Time A.M.	P.M.	Time A.M.	P.M.	Time A.M.	P.M.	Time A.M.	P.M.	Time A.M.	P.M.	Time A.M.	P.M.	Time A.M.	P.M.	Time A.M.	P.M.	Time A.M.	P.M.	Time A.M.	P.M.	Time A.M.	P.M.	Time A.M.	P.M.
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Pulse per Minute	68	64	68	66	60	64	68																								
Respirations per Minute																															
Motions per 24 Hours	/	/	/	/	/	/	/																								

School List

Discharged

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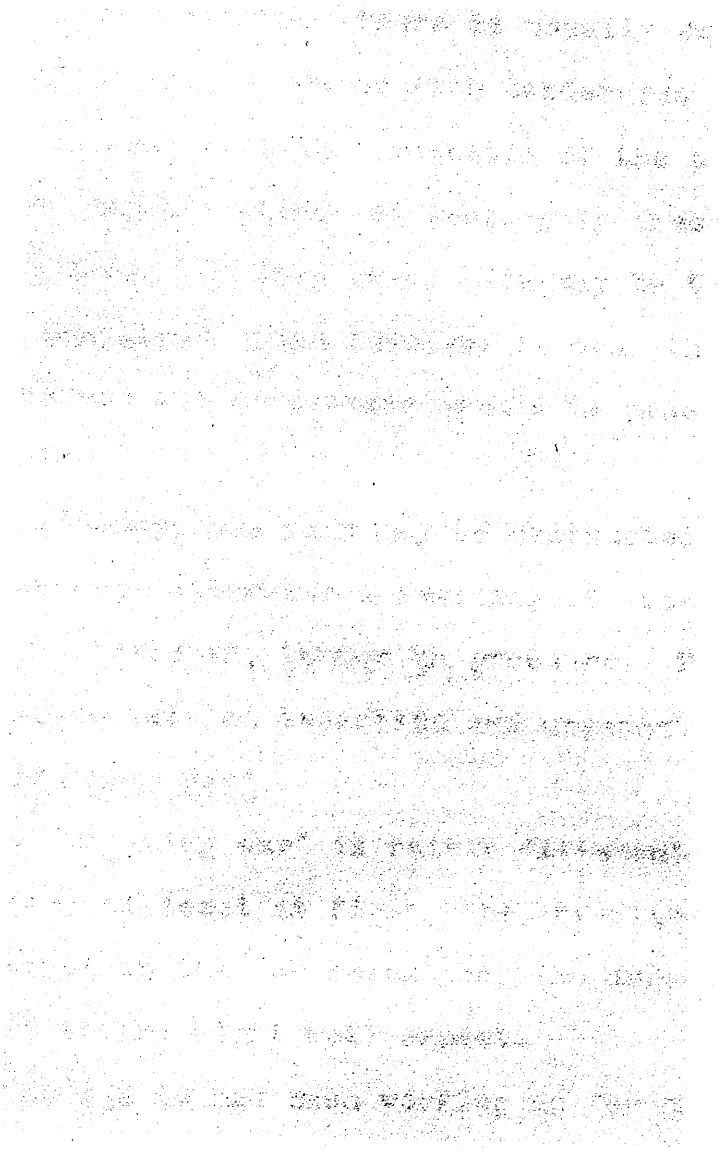

Chart I. Demonstrating a case of acute suppurative Otitis Media complicated by sore throat and Otitis Externa.

But the diagnosis rests on the physical examination rather than on symptoms. There is usually swelling near the external acoustic meatus with tenderness on putting a finger in it and pressing. Adenitis of the preauricular or external jugular glands is frequently present along with tenderness. In some cases this may be the first symptom. One gland often involved is near the tip of the mastoid process and no mistake should be made as to the part palpated.

On otoscopy the view may be obstructed by the swollen meatus; otherwise a swelling of some part of the canal can be detected, tender on pressure. The speculum usually causes pain on insertion and movement.

B. The "Swimming Ear".

The "swimming ear" is rather different. In furunculosis, at least at first, the infection is localised, whereas in the "swimming" ear the infection is more generalised as one might well expect.

"A boy age 15 had been working up for his bronze medallion for a fortnight, swimming twice daily. He reported on January 18th complaining of deafness and "clogging up" of the right ear. Temp. 99.6°F. The outer ear "looked" tender on otoscopic examination and the drumhead landmarks were not clear - the membrana tympani had a general "ragged" appearance, tender and bleeding on touching with a cotton wool swab. The external canal was also inflamed near the drumhead. (The latter itself, it

should be noted, was not glazed, bulging or throbbing).

Two days later the anterior wall was so swollen that the tympanic membrane could not be seen and the pre-auricular gland was inflamed and tender. This subsided in three days when only a slight redness over the handle of the malleus could be observed. In another three days he was discharged to duty. Temp. never rose above 99.8°F."

This is the more difficult type to differentiate from acute Otitis Media; a furunculosis of the ear being relatively simple.

The chief points are:-

(1) The inflammation of the external ear as well as the drumhead.

(2) The acute haemorrhagic "ragged" appearance of the drumhead as against the glazed, bulging and frequently throbbing membrana tympani under pressure.

(3) Large pieces of desquamated epithilium usually appear as healing progresses.

(4) The modest rise in temperature.

(5) For those who wish laboratory help the staphylococcus is the usual causative agent.

Treatment. I personally use a wick of Glycerin Mag. Sulph. packed in tightly for its osmotic effect and freedom from "sticking", and I have seen no reason to change my line of treatment though other writers prefer different chemicals.[9]

There is one complication of acute Otitis Media worth describing - an abscess appearing over the mastoid process. I have had two such cases in the series, and have had previous experience of them. On one occasion when going North in a destroyer from Hong Kong I had the ship diverted to Shanghai as I was a little doubtful of the diagnosis. The decision had to be arrived at early as the ship was off Shanghai at the time and Wei-hai-wei was still two days off; and treatment in a destroyer to say the least of it, is difficult even in good weather.

In this condition an acute Otitis Externa has been present probably for some days. The patient complains of pain and tenderness over the mastoid process. But on examination the pinna is found to be pushed forward and the retro-auricular groove obliterated. The pain and swelling are relatively high up near the posterior root of the zygoma and even superior to the pinna and not at the tip of the mastoid process. The ear in fact appears to be "floated up".

Fluctuation may be detected and aspiration or incision confirms the diagnosis, the pus being extra-periosteal.

VII. SYMPTOMS AND SIGNS OF ACUTE MIDDLE EAR DISEASE.

The rapidity of onset is remarkable. It is acute obstructive in type and requires operative treatment. The following case illustrates this and points out the symptomatology.

"A boy age 15 reported to me about 6 p.m. on February 4th with this history:-

"Just before divisions (9.15 a.m.) on Sunday, February 4th, I blew my nose and a deafness came on in the right ear. During church it was just the same. After dinner (12.30 p.m.) it began to ache and by 3 o'clock was very sore. At 6 o'clock I was seen by the Medical Officer. The pain was constant and it was a dull ache."

On examination the drumhead was acutely inflamed, bulging and throbbing, the light reflex gone and deafness was present. A paracentesis was performed about 7 p.m. and the Sister standing beside me could hear the hiss as the incision was made. A heavy sero-sanguinous discharge came away and the pain disappeared."

The points to be observed are:-

(1) The common cold - it was of some 3 days duration.

(2) The blowing of the nose and resultant deafness (loss of function).

(3) The onset of pain.

(4) The relief of pain after paracentesis.

(5) In contrast to Otitis Externa, streptococcus haemolyticus rather than staphylococcus is the most frequent causative organism.

The discharge had nearly ceased by February 8th which was fortunate as an acute Otitis Externa developed, obscuring the drumhead. By February 13th the Otitis Externa was practically cured. He was discharged to duty

on February 17th cured apart from some 50% deafness which was steadily improving.

Acute Otitis Externa is a frequent sequela due to the pus from the middle ear infecting the external canal. This is another reason for early extensive paracentesis as the Otitis Externa makes this operation more difficult and on occasion well nigh impossible. Some cases do remarkably well.

"A boy age 15 was transferred to the surgical section after two days in hospital with a common cold. Earache had just begun, he had some deafness and only the posterior quadrants of the drumhead were inflamed and slightly bulging. The light reflex was impaired.

Paracentesis was performed immediately and a little pus came away and pain was relieved. On the third day after myringotomy temperature was normal and there was no discharge. The incision was practically healed. Five days after the onset of earache the patient was sent to duty. Only a little redness of the drumhead remained and hearing was nearly normal."

But the usual duration of the illness is longer and on the whole if the discharge ceases in 10-14 days the result is considered satisfactory, because this is about the normal duration of a common cold and if the ear heals as rapidly as the cold disappears, patient and doctor ought to be pleased.

Chart II shows this admirably. Such a satisfactory

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CLINICAL CHART.

(*To be attached to Case Sheet.*).

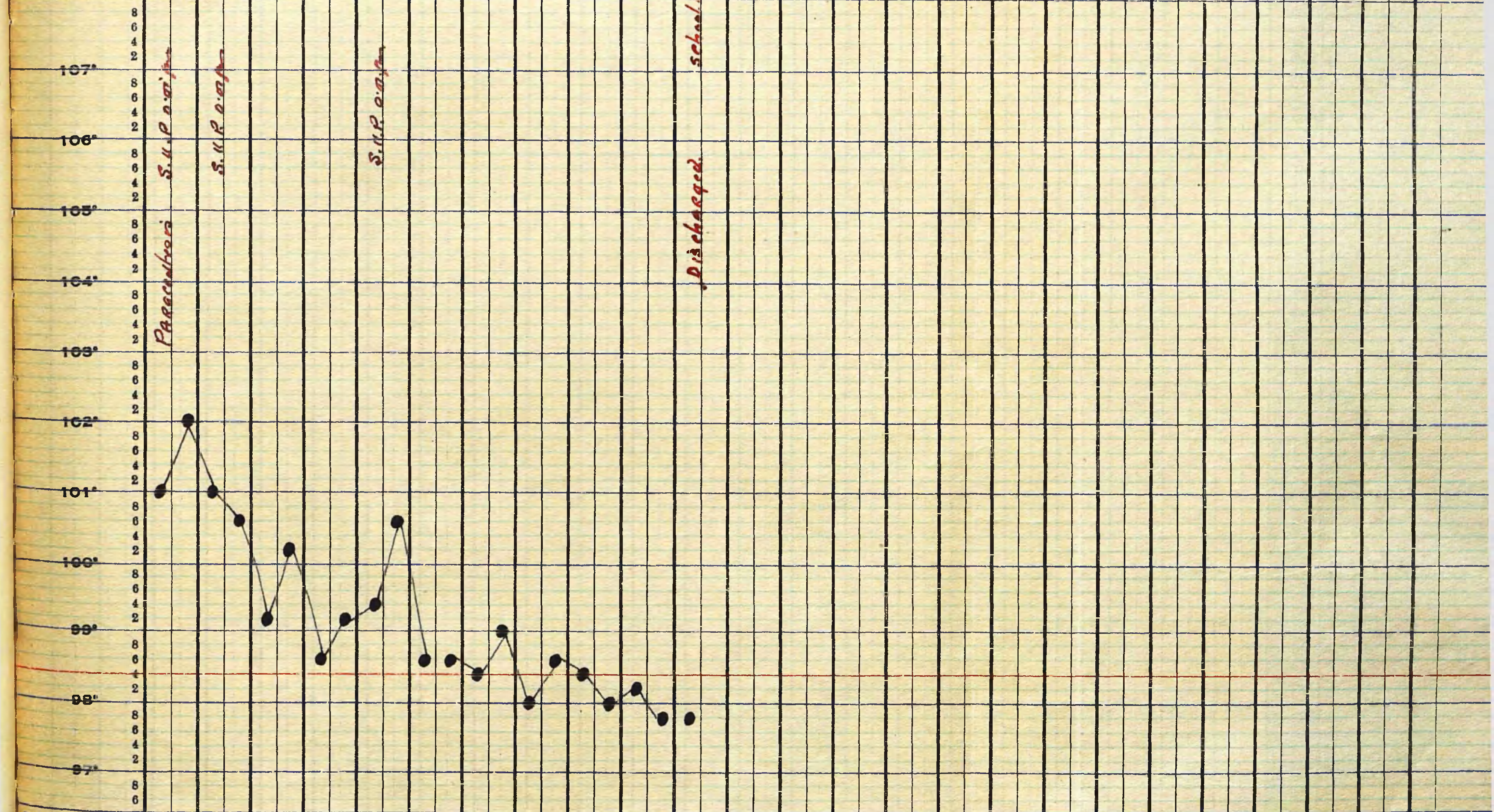
Unit or Ship ______________________

Official No. ______________________

Hospital ______________________

Disease Jaw. *Rank or Rating and Name* ______________________ *Age* ________ *Service* ________

Dates of Observation	27.	28	29.	30	31.	1	2.	3	4	5	6	7	8	9	10	11	12.	13	14.	15	16	17.	18	19.	20
Days of Disease		1	2.	3	4	5	6	7	8	9	10	11.	12	13	14	15	16	17	18	19	20	21	22	23	24
Temperature, Fahrenheit	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.
Pulse per Minute	80 90	84 84	72 92	66 98	64 90	76 98	66 68	61 65	60 72	92 74	72														
Respirations per Minute																									
Motions per 24 Hours	/ .	. /	. /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/														



Signature ______________________

Army Form B. 181
Naval Form M. 41
R.A.F. Form 549

CLINICAL CHART.

(To be attached to Case Sheet.).

*Unit or Ship*____________________

*Official No.*____________________ *Hospital*____________________

*Disease*____________________ *Rank or Rating and Name*____________________ *Age*________ *Service*________

Dates of Observation																									
Days of Disease																									
Temperature, Fahrenheit	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Time A.M. P.M.	Tim A.M.P.M.
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Respirations per Minute																									
Motions per 24 Hours																									

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*Signature*____________________

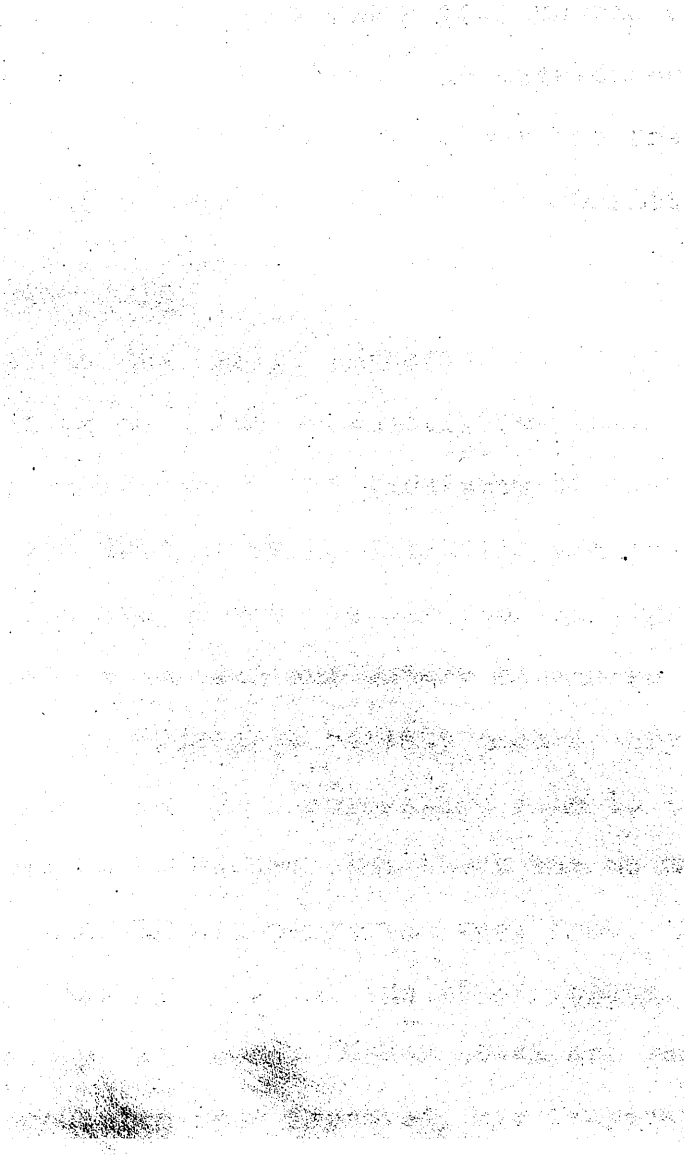

Chart II. A simple case of acute Otitis Media without complications.

result has not been achieved in all cases. The purulent discharge may change to a thick ropy mucoid one, with at least delay in healing, if not the development of a chronic Otitis Media. Such ear cases are frequently accompanied by a more or less severe bronchitis.

VIII. MASTOIDITIS.

This is the really important complication and the doctor must be on guard constantly for this sequela. My first case warned me of the virulence of the disease and the immediate need of early diagnosis and treatment.

"A boy age 16 was admitted on the night of February 27th with pain and watery discharge from the right ear. The discharge rapidly became very profuse and purulent. On March 2nd temperature rose to 105.2°F. and he had a severe headache: but there was no mastoid tenderness and the discharge was very free. A full examination was made of all the other organs, but no other etiology was found. Under local and general treatment his condition soon improved, his temperature becoming normal on March 7th.

Until March 13th the patient felt very comfortable. His temperature was relatively steady, his pulse normal and good and his general condition excellent. On that date, however, he complained of right-sided headache. No mastoid tenderness was present and the aural discharge was free. Temperature 100.6°F. Next day temperature was 99.8°F., the headache was worse, the discharge very copious,

but a swelling was noticed on the posterior meatal wall near the drumhead and operation was decided on provisionally by the Surgeon Captain in charge, provided the patient did not improve.

At 3.30 p.m. the same afternoon the patient showed signs of collapse with rising temperature and rapid pulse. Head retraction was present and Kernig's sign positive; delirium was exhibited at times and he was practically unconscious - obvious signs of meningitis.

Operation was performed as soon as possible, pus being found just beneath the outer layer of bone. Lumbar puncture produced 50c.c. of turbid fluid, and mixed anti-streptococcal serum was administered intra-thecally. But the boy never regained consciousness and died next day.

The laboratory findings on this case were:-

(1) March 5th. Culture from discharge: Staphylococcus Aureus and short chained streptococcus grown.
White Blood Cell count; Leucocytes 12,000 per c.mm.
Polymorphes 82%.

(2) March 14th. Cerebro-spinal fluid:
Cells 20,000 per c.mm.
Polymorphs 93%.
Globulin increased.
Sugar less than 0.02%.

Direct slide: Gram positive capsulated diplococci and gram positive single cocci found. No streptococcal forms seen.

(3) March 16th: Cells 44,000 per c.mm.

Direct slide: Gram positive diplococci present.

Remarks. This case had caused me much anxiety and I had obtained the opinion of four other medical officers none of whom was alarmed. I had studied the text books from two of which I may quote.

"The prognosis of the majority of cases (of acute purulent Otitis Media) is good..... Mastoid tenderness should pass off completely within three days after the discharge from the ear has been established. Otorrhoea should cease in from seven to twenty-one days."[10]

"The chief symptoms (of acute mastoiditis) are pain, tenderness, redness and oedema over the mastoid process, with pyrexia and possibly rigors occurring in a patient suffering from middle ear suppuration. The auricle is commonly displaced forwards and downwards in adults and in a downwards direction in children."[11]

Reviewing this case one might suspect a sinus lesion with the high rise in temperature on the third day. But no signs were present of mastoid disease at the time, the discharge was very copious and the temperature gradually subsided. Some mastoid tenderness must surely have been present on the morning of operation, though the day before there is a definite note that no mastoid tenderness was present. And it must be remembered that the operating surgeon was kept in constant touch with the case, this

being before such cases were sent to Chatham.

But after this illumination I never waited again for the text book signs of mastoiditis: obviously the disease was of an acutely virulent type and from my experience Otitis Media was becoming relatively common. I had not seen a case of mastoiditis for years, the patient mentioned in the 1928 statistics having contracted the disease on leave. Incidentally he died of meningitis.

Here it would be opportune to quote another case to illustrate the results of my experience.

"A boy age 16 contracted Acute Suppurative Otitis Media (in the right ear) on August 20th whilst on leave. On returning on August 30th the condition progressed well until October 2nd when he contracted a severe cold with some sore throat. Temp. 100.6°F. A thicker and more purulent discharge was coming away from the perforation in the drumhead. On October 6th his temperature became normal and remained so for four days. On October 9th there was slight mastoid tenderness and on the evening of October 10th when I first saw the case, temperature had risen to 100.8°F., he had some headache and mastoid tenderness was definitely present, with wincing on pressure. I arranged to operate next morning, having telephoned to a surgeon to come and assist me.

Now is the interesting point. The patient had had a fairly comfortable night, but had been partially prepared for operation. Before proceeding the case was seen by two

other doctors; one had been attached to the "Training Service" for four years and rather prided himself on his knowledge of boys; the other, the Surgeon I had asked to assist me, was a Glasgow graduate and an F.R.C.S.(Ed.). They both decided against operation. Yet despite the fact that I considered both doctors very able men, in the light of previous experience and also from the fact that in my opinion, they failed to observe the patient's face when testing for mastoid tenderness, but rather asked if he felt pain, I was distinctly unhappy and sent the case to the Ear, Nose and Throat specialist at Chatham the same day. Unfortunately, operation was delayed till October 11th (i.e. the day after), and the patient died of septic meningitis on October 15th, evidence of which appeared on October 14th, No localising signs of intra-cranial complication ever presented themselves; he had vomited on October 13th and complained of headache; later he curled himself up in bed and refused to bend his head off the pillow, resenting interference.

Streptococci were found in the cerebro-spinal fluid.

My only further remarks on this case are that as the patient had had otorrhoea for over six weeks, mastoid-ectomy had already been indicated.

I had now formulated the conclusion that the five features of any importance when dealing with boys are:-

(1) Pain often described as headache and located behind the ear.

(2) Some cessation of discharge.

(3) Rise in temperature, especially secondary rise indicating retention of pus.

(4) Mastoid tenderness not necessarily very acute.

(5) Swelling of the posterior meatal wall near the drumhead.

3 and 4 are the really important features which indicate the need for immediate operation.

Temperature chart III. shows this clearly.

The patient's face should always be observed when examining for mastoid tenderness. He may be afraid of operation and deny pain when visible wincing is present on pressure. It is quite simple to span both mastoids with the hand behind the head and observe the face from in front. Flickering of the eyelids or twitching of the face can then be seen on the affected side. Perhaps a more delicate test is percussion of the mastoid process.

I have never yet seen amongst my cases swelling, oedema and displacement of the pinna, even amongst those who developed intra-cranial complications before or after operation.

As against this the problem in the adult is quite different and much simpler.

"A marine age 35 was admitted on December 19th with right earache of one day's duration and a common cold. On

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Naval Form M. 41
R.A.F. Form 549

CLINICAL CHART.

(*To be attached to Case Sheet.*).

Unit or Ship _____ *Hospital* _____

Official No. _____

Disease april *Rank or Rating and Name* _____ *Age* _____ *Service* _____

Dates of Observation	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Days of Disease		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Temperature, Fahrenheit — Time A.M. P.M.															
Pulse per Minute		75 88	68 90	78 76	76 72	72 70	72 76	70 70	58 60	60 62	60 62	60 52	76 64	64	
Respirations per Minute															
Motions per 24 Hours	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1	

Mn. Butyrate 1cc. Parenteris.

To R.N.H. Chatham.

*[4351] W1769/1134 60m 1/32 69 G & S 122 Forms/B181/10

Signature _____

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CLINICAL CHART.

(*To be attached to Case Sheet.*).

*Unit or Ship*____________________

*Official No.*____________________ *Hospital*____________________

*Disease*____________________ *Rank or Rating and Name* ____________________ *Age*__________ *Service*__________

Dates of Observation

Days of Disease

Temperature, Fahrenheit — Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M. | Time A.M. P.M.

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105° 8 6 4 2
104° 8 6 4 2
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99° 8 6 4 2
98° 8 6 4 2
97° 8 6

Pulse per Minute

Respirations per Minute

Motions per 24 Hours

*[4351] W1769/1134 60m 1/32 69 G & S 122 Forms/B181/10.

*Signature*____________________

Chart III. A case of acute Otitis Media showing secondary rise in temperature accompanied by mastoid tenderness.

This patient was particularly interesting: operation was not performed on April 17th and he appeared to get better being sent to duty on May 4th. But he returned with Mastoid tenderness on May 23rd when operation was required. I consider him very fortunate not to have died of a cerebral complication. An instance of residual infection of the mastoid cells lighting up.

examination the right drumhead was found to be acutely inflamed, tender and bulging, the light reflex absent and function impaired.

Paracentesis produced a rush of sero-sanguinous pus under high pressure. Despite free drainage on December 22nd there was a slight definite mastoid tenderness which subsided with the temperature in three days. The discharge gradually lessened but he developed an exfoliative dermatitis on the trunk and limbs perhaps the result of an injection of Manganese Butyrate or more probably due to streptococcal toxaemia. On January 3rd his temperature rose to 101.2°F. and mastoid tenderness returned; a further paracentesis was performed with free discharge of pus.

On January 5th he had an operation for mastoiditis, made excellent progress and returned to duty in a month perfectly fit. He was a particularly robust type.

In another subacute case in an adult, the mastoiditis got better without operation.

IX. TREATMENT.

Treatment is carried out on the basic surgical principle of establishing through and through drainage as early as possible. Attention must be directed to the drumhead and the throat and nose from which the infection almost invariably arises. The following instruments are required:-

(1) Myringotome.

(2) An operating electric auriscope. This instrument is invaluable and if one has to give one's own anaesthetic, essential.

(3) Apparatus for the giving of N_2O. (Evipan is a possible substitute).[12]

(4) Probes for the mopping out of ears. An excellent instrument is a large safety pin with the point removed and the end roughened. This gives a well-balanced instrument of small bore so that the operator can see past the probe and small cotton wool swab when using it through the speculum.

The question of anaesthesia is very important. Dewar[13] a general practitioner says "In the acute case I have never incised the drum and have never seen it done. I worked for some fifteen years for other doctors, None of them ever did it, and most of them admitted they had never done it..... The trouble about incising the drum is the need for a general anaesthetic."

A. Paracentesis.

A paracentesis is performed immediately there are signs of inflammation of the middle ear.

(1) Place the patient in bed with the unaffected ear on the pillow and flat on his back to keep the shoulder out of the way.

(2) Examine the affected ear with the electric auriscope to locate the site for incision. Do not move the head from this position.

(3) Administer Nitrous Oxide with a portable apparatus. This can be performed easily by the operator and saves much time especially when an anaesthetist is not available and paracentesis urgent. By putting the patient under and continuing re-breathing until the incision is made I have never experienced any trouble whatever, though with men it is rather more difficult than in boys,who take the gas well.

With an assistant to quickly hand over the operating auriscope and the myringotome this slight operation takes no more than half a minute after the patient is under. A good sized incision should be made in the posterior inferior quadrant and not simply a stab wound. One must see that the screw securing the blade to the handle does not catch in the rim of the auriscope.

B. <u>After-treatment.</u>

As soon as the patient comes to, the head is turned over to the affected side to let the pus drain on to a gauze pad under which is a rubber hot water bottle suitably covered with a flannel bag.

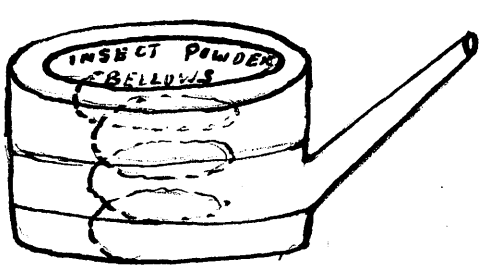
The one essential is to maintain free drainage by (1) gravity and (2) the frequent mopping out of the external canal to prevent any accumulation and possible damming up of pus. The amount of pus coming away after paracentesis is nearly incredible in some cases. Further if the earache is not fully relieved after paracentesis, it means that drainage is insufficient, and the operation should be repeated.

(<u>Footnote</u>: The exception is in acute haemorrhagic Otitis Media - see appendix.)

If anything incisions of the drumhead are inclined to close too soon and I have met with only one chronic perforation following paracentesis. This was in a boy with a double acute Otitis Media: one drumhead healed, the other remained with a small perforation. It must be realized that after incision of the membrane the congestion and oedema subside thus encouraging closure: Nature's usual method of making a large perforation avoids this.

The sooner the discharge is brought under control the less is the possibility of complications and the more the chances of complete healing thus avoiding chronic otorrhoea.

At night the outer ear is filled with Magnesium Sulphate crystals ground fine and introduced with a powder insufflator as recommended by Williams[14]. The one used here was obtained from a chemist for ninepence and is called an Insecticide bellows. It is a round tin with a rubber lid and spring attachment and tin nozzle and is really effective (see diagram).



(This pattern of bellows is manufactured by May, Roberts, Clerkenwell Road, London.)

The crystals to my mind absorb more discharge

and help drainage during the dark hours when I do not want the patient disturbed from his necessary slumber for mopping of the external canal.

Nearly all cases are affected with at least common colds or sore throats - the usual origin of the otitis media. Accordingly every effort must be directed to relieving the nose and throat condition and to re-establishing the connection between the middle ear and throat - through and through drainage the paracentesis having been completed.

An atomiser at frequent intervals and gargles is an effective method allied with frequent blowing of the nose. Not until the nose and throat condition improves does the ear improve.

C. General Treatment.

I give S.U.P. or Manganese Butyrate. It is difficult to judge the efficacy of these drugs but it is my impression they help in certain cases. Yeast, Tinct. Quin. Ammon., Cod Liver Oil and Malt, cough mixtures etc. are all exhibited as occasion requires.

But to sum up: of all treatment free drainage is essentially important and the great comfort of a hot water bottle has to be seen to be believed; when the patient uses it for his feet instead of his ear it can safely be surmised that the worst is over.

Temperature Chart II. shows the effectiveness of this treatment admirably.

In the absence of complications the acuity of hearing, which is affected first, recovers rapidly up to fifty per cent of normal function. The return to complete normality is then slow and perhaps never quite complete. The reason - some fibrosis of the drumhead but more probably, in my opinion, adhesions in the small joints of the ossicles due to the surrounding inflammation.

Politzerisation is the treatment recommended.

X. CONCLUSIONS.

(1) Acute Middle Ear disease is at the present time on the increase and with it the complications, especially Mastoiditis (about twenty per cent of cases).

(2) Paracentesis should be performed as soon as possible to establish drainage as it may avoid this complication and certainly diminishes the incidence of chronic otorrhoea.

(3) In boys early diagnosis of mastoiditis is essential, as intra-cranial spread occurs rapidly about the age of puberty.

(4) The two chief diagnostic points of Mastoiditis are:-

(a) Mastoid tenderness.

(b) A secondary rise in temperature in a case which appears to be doing well.

APPENDIX

The main trunk of the thesis having been completed, the offshoots can now be considered, e.g.

1. Reasons for the large incidence of Otitis ~~Media~~ EXTERNA
2. The etiology of Middle Ear Disease - any specific instance of overcrowding at Shotley.
3. The relation of Minor Respiratory Infections to the state of the recruits throats and noses, and the possibility of some diminution by correcting faults soon after joining.
4. The results of Paracentesis on Otitis Media,
   (a) Pain
   (b) Is cure effected earlier?
   (c) Can statistics be produced to show its efficacy in preventing mastoiditis?
5. The possible route of infection from the middle ear to the meninges and brain.

1. Reasons for the large incidence of Otitis Externa.

There can be no question that swimming has a large connection with this disease. In at least half the cases there is a history of being a backward swimmer, a candidate for an award of Merit or a Bronze Medallian from the Royal Life Saving Society, and this naturally entails more practice. All boys have to learn to swim before going to sea, and having learned they become enthusiastic over such games as

waterpolo and the inter-divisional competitions. The load on the bath is accordingly heavy; but an effort has been made to keep the numbers down by instituting a "mess" swim only once a fortnight. [DIAGRAM ENCLOSED]

A new and larger swimming bath is to be constructed and it will be interesting to see what effect it has. Judging by current talk and press reports cases are very common amongst the general public.

2. Overcrowding.

Comparing messes in Shotley is difficult: usually they are averaged up, as boys fall out for disease, etc. as a boy "dips" a class if he is over fourteen days on the sick list. But by chance one Divisional officer told me he had two messes with a discrepancy. The figures are valueless for statistical purposes as they are too small, but for what they are worth they are recorded.

	Mess A	Mess B
Average no. in mess	43 (about)	50 (about)
Arrangements for sleeping	staggered	staggered
Floor area of sleeping space	2520 sq.ft.	2520 sq.ft.
Average floor space per boy	59 sq.ft.	50 sq.ft.
Cubic capacity (height 12 ft.)(a)	30,240	30,240
" " " 9 ft.)(b)	22,680	22,680
Average cubic capacity per boy(a)	703	605
" " " " " (b)	526	453
Incidence of disease (all)	11	14
Case rate per 1000 p.a.	1023	1120

These figures show a discrepancy certainly, but the figures for the whole establishment are 673 for 1668 boys - a case ratio per 1000 per annum of 1614; and even omitting injuries of which there happened to be none in either mess the case ratio for the establishment is still 1572 which is considerably higher than either of the two messes A or B.

Remarks on cubic capacity and floor area.

The Board of Education suggested minimum for schools is

(1) 3 feet between edges of beds and six feet wall space per bed.
(2) 65 sq.feet of floor space.
(3) 700 cubic feet of space.

As can be seen from the scale diagram, in the dormitories at Shotley there is adequate cross ventilation, and there are also ventilators in the roof. The cubic capacity is nearly up to standard if twelve feet of height is allowed. The average for the establishment is 673 cubic feet. But the floor area, the more important consideration, is below the minimum both in messes A and B and moreover the beds are in four rows: two rows would be a much more satisfactory arrangement.

A large scale experiment has been suggested as a means of obtaining more information on dormitory infection if the authorities would allow.

(1) That altèrnate batches of new entrants be given sleeping quarters with five feet of space between edges of their beds.

(2) That the other batches be accommodated in exactly the same way as has been the routine during recent years.

(3) That the batches who have the more spacious sleeping arrangements, feed, work and play in exactly the same way as those who sleep under the old conditions.

(4) That no other alterations in hygienic control be made at Shotley during the period of trial.

This would give really valuable information with regard to dormitory infection as only one environmental factor would be varied, i.e. the density of the night habitat.

3. State of recruits Throats and Noses on Joining

As a matter of interest records were kept of 100 recruits who joined in the last week of June and the first week of July 1934. The following are the results:-

No.of recruits	Hypertrophied and Cryptic Tonsils	Diseased Post Nasal Space	Deflected Septum
100	24	5	6
Ratio per 1,000	240	50	60

It is not suggested that all these boys should be

operated on, but 10% would not be refused treatment by an Ear, Nose and Throat specialist.

At the present time, however, tonsillectomy is looked on with disfavour in naval circles and the edict had gone forth that only boys who have had tonsillitis twice at Shotley, are to be subjected to this operation. If six weeks are allowed from the end of the second attack as a suitable interval before operation, one can realise how few are done, the vast majority of the cases having by then gone to sea. But with the appointment of an Ear, Nose and Throat specialist to the establishment, more may be done with possible but questionable diminution of the total incidence of M.R.I. Of recent years a great body of evidence shows that the effect of tonsillectomy on the incidence of all kinds of disease is very doubtful. There is no suggestion that tonsillectomy is not indicated in numerous instances, but far too many tonsils are removed with insufficient reason. As regards its effect on Otitis Glover[15] found no difference in the incidence among school children with or without tonsils.

Rheumatism.

The table in the body of the article shows a case ratio per thousand of 15 for 1932 and 17.1 for 1933 and follows the M.R.I. curve. The incidence for 1931 for some strange reason is very low (3.1) although the incidence of M.R.I. is very high.

It is of interest to note that three cases followed on Disease of Ears, (1) Mastoidectomy and Chorea, (2) Mastoidectomy and Rheumatic Fever, (3) Acute Otitis Media and Rheumatic Fever.

Comments:- It would appear that in some years Rheumatism is a not infrequent complication; but in most years otitis is common sequela of M.R.I. During the past eighteen months there has been what may be termed truly an unprecedented epidemic of otitis which is greater than any recorded in the history of the naval training establishments or any institution I have heard of. It has also been remarked that the incidence of acute appendicitis has fallen recently with the rise in middle ear disease. It is certainly the case at Shotley, where the incidence waned rapidly after March 1933. So far in 1934 there have been two cases only.

This is again interesting as another example of what appears to be selective action on the part of the infective bacteria when it is realised that tonsils, the appendix and the sub-epithelial lymphoid tissue in general are all part of the reticulo-endothelial system.

4. Examination of the Results of Paracentesis.

In the great majority of cases pain disappears immediately or very shortly after paracentesis. Tension of the drumhead is presumably the chief cause of the pain,

and incision as in any other abscess should give relief. Perforation yields a similar result. The type in which pain may fail to disappear, or is only slightly diminished is the dangerous haemorrhagic type, when complications are to be feared, septicaemia being kept in mind.

"A boy, age 16, reported sick on the evening of June 18th. He had noticed deafness and tinnitus of the right ear at 2.30 p.m.: definite earache at 3 p.m. and at 5 p.m. a discharge. The earache was a severe throbbing pain.

On examination the drumhead was found to be haemorrhagic and very tender, the light reflex was absent and he had some deafness. Temperature 98.8°F. Paracentesis was performed the same night, but only a slight haemorrhagic discharge came away with little relief of pain. By June 22nd he had throbbing and headache on the right side around the ear, with pain on lying on that side. Mastoid tenderness was present and his temperature was steadily rising. Repetition of paracentesis gave no relief.

He was sent to Chatham on June 23rd where a mastoidectomy was performed. Since when I have been informed that a septic arthritis of one of his ankles has occurred.

(b) Temperature and discharge

The effects of paracentesis have been worked out for a series of cases who had myringotomy performed and

who reacted well to treatment. The figures are:

No.of cases	Fall in temp. (average)	Discharge ceased (average)
26	4 days	15 days

Two of the cases who had prolonged bronchial catarrh and in whom the discharge became thick ropy mucus took respectively 42 and 22 days to clear up. The first case I am sure would have cleared up more rapidly if I had thought of using Bicarbonate of Soda sooner. But subtracting these two cases the figures are:

No.of cases	Fall in temp.	Discharge ceased
24	4 days	10 days

Taking the whole one may say that in acute otitis media, all being well, the temperature becomes normal in about four days, and the discharge ceases in 10-15 days; and as previously stated these figures point to the duration as that of a common cold.

Furthermore all drumheads healed.

Taking a series of figures for cases who arrived with perforations and who were discharged to duty, we get

No.of cases	Fall in temp.	Discharge ceased
14	4 days	16 days

But the interesting point is that in this series only six healed, leaving 8 with perforations and a liability to chronic otitis media. And the reason so many others have been omitted is because a large number were sent to Chatham Hospital where they spent weeks under treatment - frequently with unsatisfactory results.

(c) Mastoiditis

As a matter of interest the effect of paracentesis, as opposed to perforation, on the incidence of mastoiditis, has been considered. The statistics for 1933 are -

No. of cases	Paracentesis	Mastoiditis
28	Nil	8
18	1	1
2	3	1
48	-	10

At first sight this is suggestive but the figures for 1934 (six months) do not corroborate the evidence. The statistics for 1934 are -

No. of cases	Paracentesis	Mastoiditis
10	Nil	2
31	1	5
11	2	4
3	3	0
1	4	0
56		11

The combined statistics are -

No. of cases Otitis Media	Paracentesis	No. of cases Mastoiditis	% cases of Mastoiditis & Standard Error
38	Nil	10	26 ± 7.1
56	1 or more	11	20 ± 5.4
Total 94		21	22 ± 4.4

(The grouping of one or more paracentesis together is considered advisable as in recent months I have considered it wise to repeat the myringotomy on mastoid cases before transportation to ensure drainage during the journey.)

The percentage difference of 6 being less than its standard error of ±8.9 has no statistical significance as the figures stand in absence of further information. That is to say that had there been a purely random selection of cases for paracentesis the fact that a smaller proportion of paracentesised ears developed mastoiditis could have been easily due to pure chance. However it should be remembered that on the average the more severe cases would have been selected for operation. Mastoiditis in the absence of paracentesis would have been expected to arise more often in the clinically more severe group. However, the fact that it occurred less often in the more severe cases makes it probably fair to assume that the above distribution of mastoiditis among the non-paracentesed and the paracentesed group is in some part the direct result of the operation itself. That is to say incision of the drum had prevented a certain number of cases developing mastoiditis.

Moreover on clinical grounds paracentesis is called for in that it simply anticipates Nature's method, just as in a Whitlow incision at the proper time may save the finger.

5. The Possible Route of Infection to the Meninges and Brain.

Three cases of involvement of the Central Nervous System have already been described, and three further similar complicated cases are worthy of mention.

Case I.

A boy age 15 was admitted to the Sick Quarters on October 22nd complaining of sore throat and general malaise. Temperature 102.2°F. There was nothing definite to be made out apart from a few rhonchi at the right base. On October 25th he had pain in the left knee joint, but it was transient and disappeared on October 27th., when temperature was 99.0°F. Next day temperature rose to 100.4°F., he suffered from severe earache on the left side and that night a paracentesis was performed on an inflamed and bulging membrane. On October 30th there was a fairly copious discharge; but he had some left-sided pain behind the ear and there was some mastoid tenderness accompanied by a rise in temperature to 103°F. in the evening. He was sent to R.N. Hospital, Chatham, next day.

Operation was performed on November 1st, the day after admittance. The mastoidectomy is reported as follows: - "Pus was found superficially in the antral region lying very superficial. The lateral sinus was freely exposed - also lying far forwards. Except for the cells in the region of the antrum very few appeared to be infected."

The patient was quite comfortable until Nov.4th, when drowsiness was noticed. Kernig's sign(?) positive. On the 5th and 6th he had a rigor lasting three minutes, to be repeated on November 9th. He was then found to have an arthritis of the right hip joint and temperature rose to 104°F. From then on there was a gradual improvement in his condition, until finally he got well apart from an ankylosed hip joint.

The notes are not too satisfactory. Little seems to have been performed bacteriologically, the one outstanding feature being his white blood cell count which fell to 4,000 per c.mm. and never rose above 7,500 per c.mm. Anti-streptococcal serum was administered with beneficial results.

The final diagnosis of this case was

(1) Acute suppurative Otitis Media
(2) Serous Meningitis.
(3) Streptococcal Septicaemia.
(4) Septic Arthritis right hip.

Case II.

For this case I have to trust to other doctors' notes. I admitted him on December 19th with a traumatic synovitis of the right knee joint. Next evening his temperature had risen due to a common cold and subsequent tonsillitis. This cleared up as did his knee; but on December 29th his temperature again rose to 100.8°F. and on January 2nd his right drumhead was found to be inflamed, pulsating and tender, and a paracentesis was performed. A sero-sanguinous discharge came away and on January 5th, mastoiditis being present, he was discharged to Hospital at Chatham, mastoidectomy being performed next day as usual.

His temperature never quite settled after operation and on January 18th he had headache which developed into severe frontal headache accompanied by vomiting and a slow pulse; the eyes were normal, there being no hemianopia or papilloedema. However, on January 25th the dura was exposed, nothing definite being found. On January 31st the left ear exhibited an Acute Otitis Media; a paracentesis produced little result. On February 7th the headache and vomiting were more violent, he was drowsy, the pulse was slow and knee jerks absent. His temperature was normal and there was no optic neuritis. Lumbar puncture showed the pressure of the cerebro-spinal fluid to be slightly

increased and the cells 9 per c.mm.

But by February 11th he had definite clinical nystagmus to the right side, weakness of the right arm and leg, imperfect pointing of the right forefinger, slurring speech, slow pulse, vomiting and dysdiadokokinesia. The cerebro-spinal fluid was normal.

On February 14th a rapid mastoidectomy was performed on the left side, little being found.

The right cavity was then re-opened, the lateral sinus being fully exposed along with the dura mater of the middle fossa. The bridge of bone between the posterior and middle cranial fossae was taken away exposing the superior Petrosal Sinus. About a teaspoonful of pus was evacuated from the cerebellum and the patient after a long convalescence was discharged cured on 25th May, 1934.

Comment: From this description it appears that the spread to the cerebellum was behind the lateral sinus and probably was conducted by bone.

Case III.

This boy reported on January 30th with a discharge from his right ear of two days duration. He had a slight cold in the head, he was deaf in the right ear and temperature was normal. Aural examination showed a thick discharge to be coming away from an anterior perforation in the drumhead, which was under tension and throbbing.

Paracentesis was performed and the discharge increased. But on February 3rd he had slight mastoid tenderness, temperature began to rise and next morning he was sent to Chatham Hospital with a very acute mastoiditis accompanied by severe pain and mastoid tenderness on percussion and pressure.

He was operated on the same evening but stood the anaesthetic badly. The lateral sinus was far forwards and apparently there was difficulty in completely clearing all the mastoid cells. The patient never did well and despite a further operation, died of a tempero-sphenoidal abscess.

The Surgeon was of opinion that the route of infection to the Brain was through the Tegmen Antri.

Post Mortem Report on Case III.

Rigor mortis present. Well nourished. Recent operation wound left mastoid region extending into middle fossa of skull. Some distension of bladder. No fluid in pleural or peritoneal cavities, a few fibrous adhesions in left pleural cavity.

Considerable congestion of bases of both lungs (L. 15½ ozs., R.18½ ozs.) Nothing remarkable in heart (12½ ozs), Spleen (9 ozs.), liver (550 ozs.), Kidneys (6½ ozs. each).

No enlargement of thymus. Some enlargement of lymphatic glands in cervical and lumbar regions.

Brain 49½ ozs. No excess of arachnoid fluid. No thrombosis of Venous sinuses.

The interior of the right temporo-sphenoidal lobe was occupied by an abscess cavity 1½" across. This had a substantial wall which could be cut with a knife and outside this the brain substance was yellow in colour and almost fluid, so that, when the brain was removed, the intact abscess wall detached itself from the brain and was left adherent to the operation wound. The softening extended into the outer part of the optic thalamus and the right lateral ventricle was full of blood clot.

Right Temporo-sphenoidal abscess. Mastoiditis.

Route of Infection.

Four cases of death following Mastoiditis have now been recorded:-

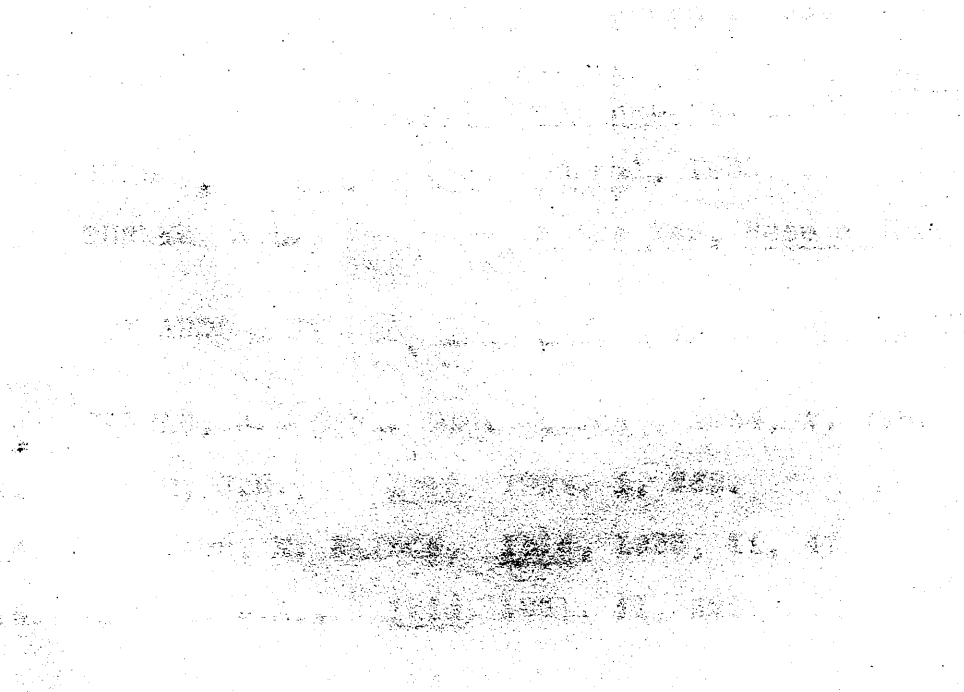
(1) The boy who died in 1928 at Manchester of Meningitis.
(2) " " " " " 1933 " Shotley " "
(3) " " " " " 1933 " Chatham " "
(4) " " " " " 1934 " " " Temporo-sphenoidal abscess.

In addition two after complications recovered:-

(1) The boy with (a) Serous Meningitis.
(b) Streptococcal Septicaemia.
(c) Septic Arthritis Right hip.
(b) The boy with Cerebellar abscess.

Until proper research is carried out on the lines

of Gray[3] the specific route of infection can only be hazarded. But from the fact that Meningitis occurred in four cases, and that the Surgeon considered bone to be the route of infection in the Cerebral and Cerebellar cases and that the sinuses never seem to have been involved, I am of opinion that conduction by bone is the likeliest route in boys of this age.



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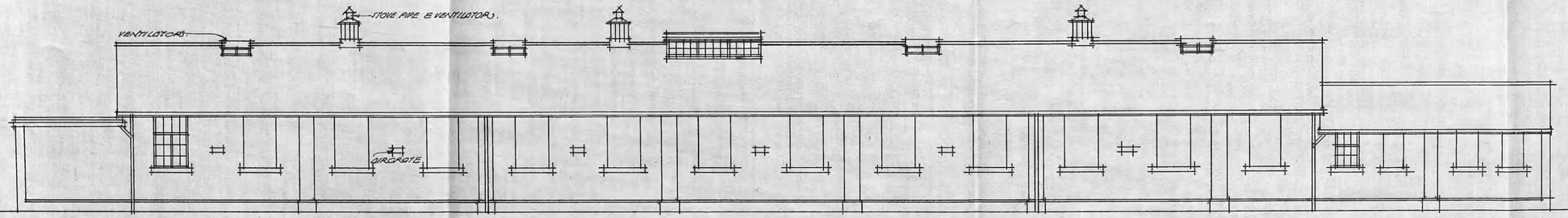
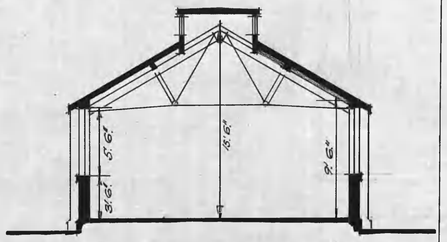
E N C L O S U R E S.

1. SCALE DRAWING OF A MESS.
2. EXTRACTS FROM ANNUAL REPORT OF NAVAL HEALTH OFFICER, NORE COMMAND.
3. LOAD ON THE SWIMMING BATH (DIAGRAMMATIC)
4. PHOTOGRAPHS.



SIDE ELEVATION.



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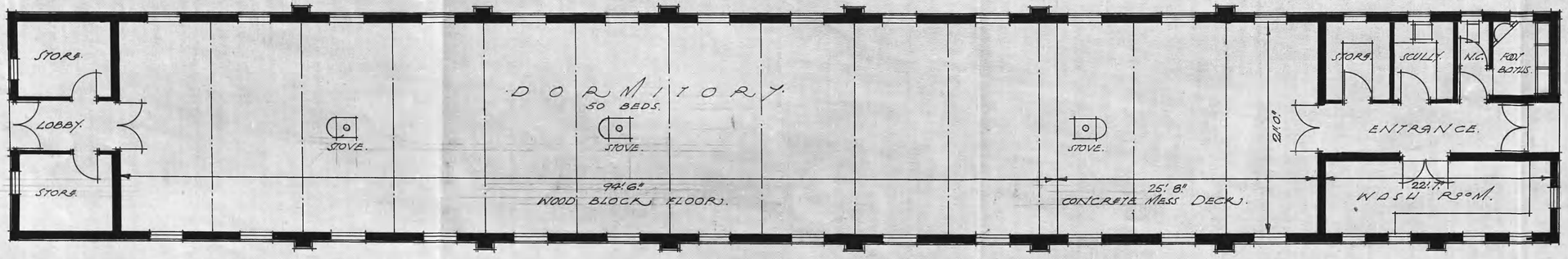

GROUND FLOOR.

H.M.S. GANGES. HARWICH.
TYPICAL DORMITORY PLAN.
SCALE ONE INCH = 8 FEET.

ON HIS MAJESTY'S SERVICE.

8 Photographs

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1881

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Parade Ground
River Orwell.

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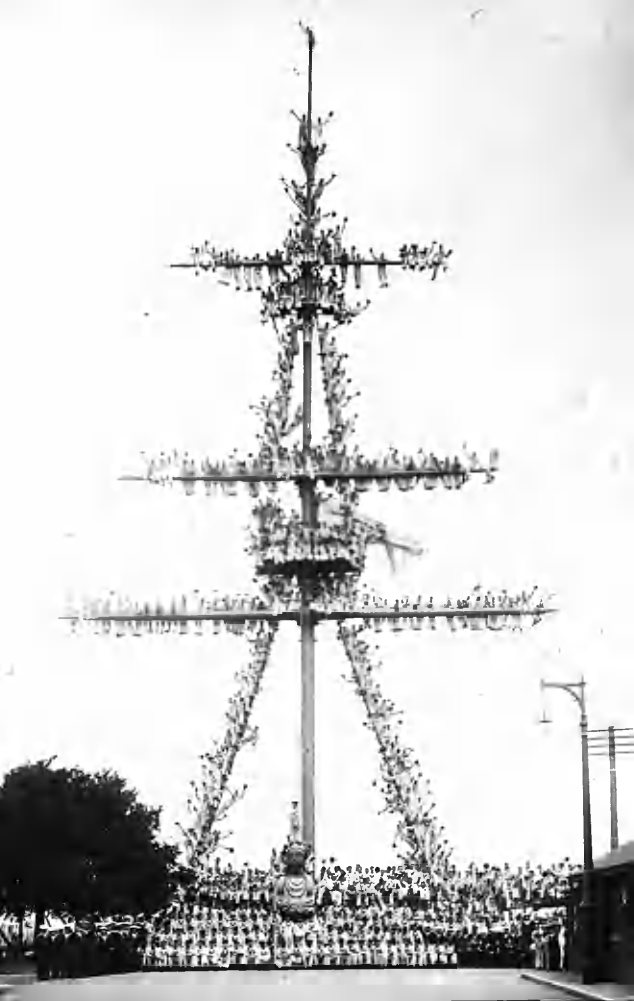

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The mast.

Figure-head No. 28.

"Europa" in the foreground

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Looking South to the
River Stour & Essex

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Covered Way. Shorncliffe Barracks

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Long Covered Way.
Houses on either side

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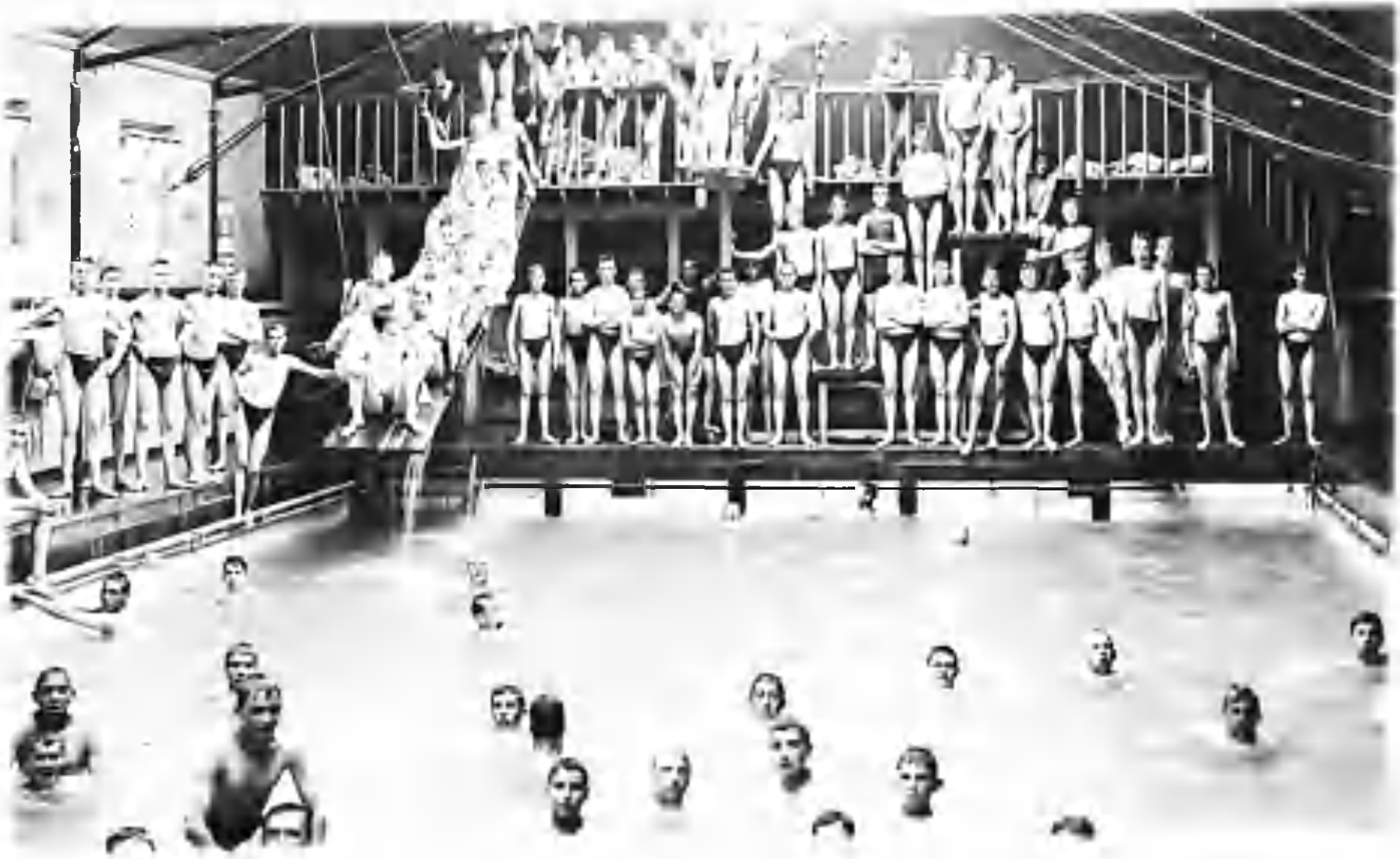

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EXTRACTS FROM THE

ANNUAL REPORT

OF THE

NAVAL HEALTH OFFICER

NORE COMMAND

FOR THE

YEAR

1933.

REMARKS ON THE ANNUAL REPORT OF THE
NAVAL HEALTH OFFICER

Page 2. General Health.

Probably the factor of greatest account is that in H.M.S. "Ganges" the rate of recruiting has risen very rapidly and the period of training shortened.

In the Mechanical Training Establishment, Fisgard, the boys remain for three years.

In R.M. Depot Deal, the marines age is eighteen on joining.

The rates per thousand for infectious disease tell their own tale.

COMPLEMENTS OF SHIPS AND ESTABLISHMENTS.

The average daily complement of the various Ships and Esrtablishments within the Nore Command for which this report is rendered are as follows:-

In addition, there have been a certain number of ships either commissioning for, or returning from Foreign Stations, the average daily complement of which are not included.

R.N.Barracks, Chatham		4328.
Mechanical Training Establishment.....		622.
Nore Reserve Fleet.....		1005.
Royal Naval Hospital, Chatham, (Staff).....		217.
Royal Marine Barracks, Chatham		756.
Royal Marine Depot, Deal.....		975.
H.M.S. Ganges.	BOYS.....	1513.
	SHIP'S COMPANY. (ie. officers & men)	397.
H.M.S."Kellett"		85.
H.M.S."Fitzroy"		79.
	TOTAL	9977.

MUNICIPAL POPULATION.

Notifications of infectious diseases occurring among the civil population in the Port of Chatham - Sheerness, are received weekly from the Medical Officers' of Health of Chatham, Gillingham, Rochester, and Sheerness.

The combined population of these districts is estimated to be approximately:-

138,000.

INFECTIOUS DISEASES.

The approximate numbers from which this return is compiled is 9977, this number being the average daily complement as taken from the Nosological Returns of the Establishments and Ships permanently in the Command.

Where diseases have been notified from a ship of the Home or other Fleets, these cases have been shown under the heading of "other ships".

GENERAL HEALTH.

The health of the personnel for the year 1933, does not compare favourably with the two previous years 1931 and 1932.

This is largely due to the following causes:-

(1) The prevalence of Influenza during the months of January and February, viz:-

583 cases notified in the first quarter of the year.

610 in the whole year.

(2) The increased notification of Tonsillitis viz:-

804 cases spread throughout the year.

(3) The increase in the numbers of New Entries in H.M.S.Ganges and H.M.S.Pembroke.

It is considered desirable to mention that in the former Establishment owing to New Entries arriving at frequent and not terminal intervals, the control of infectious disease is rendered less easier than in the Chatham Mechanical Training Establishment; alos, the Chatham Establishment is far more satisfactory from constructional hygienic view point.

Of the total nimber of Notifications received, viz:-

1689.

H.M.S.Ganges	account for	838. cases,	i.e. 49.5%
M.T.E.Fisgard	: :	92 : :	5.4.%
H.M.S.Pembroke	: :	335 : :	19.8.%
R.M.Depot, Deal	: :	143 : :	8.6.%
R.M.Chatham	: :	74 : :	4.3.%

The comparative rates per 1000 for permanent Establishments and Ships in the Command for all infectious diseases are:-

H.M.S.Ganges, Training Establishment.....	438.74.
Mechanical Training Establishment,Chatham.	147.91.
Royal Naval Hospital Staff.....	147.46.
Royal Marine Depot, Deal.....	145.64.
Royal Marine HeadQuarters, Chatham.....	97.96.
H.M.S.Pembroke.....	77.40.

INFECTIOUS DISEASES.

Nore Reserve Ships..... 48.75.

The total rate for all infectious Diseases is :-
189.31 per 1000.

Training Establishments
(Not including Depot New Entries.....367.29. per 1000
Other Establishments.....101.94 : :

The principal Infectious Diseases accurred in the following proportions :-

DISEASE.	Per 1000 CASES OF INFECTIOUS DISEASE	PER 1000 COMPLEMENT
TONSILLITIS	478.38	80.68.
INFLUENZA	367.08	61.14.
PNEUMONIA (All forms)	30.79	5.21.
RUBELLA	32.56	5.51.
SCARLET FEVER	18.35	3.10.
MUMPS	7.65	1.30.
MEASLES	6.52	1.10.
CHICKEN POX	6.52.	1.10.
CEREBRO-SPINAL-FEVER	2.96	0.50.
ENTERIC FEVERS	1.18	0.20.
RHEUMATIC FEVER	5.91.	1.00.
TUBERCULOSIS (Pulmonary)	28.54	4.91.
OTHER FORMS	3.55	0.90.

The number of notifications of Tuberculosis has been less this year.

EPIDEMICS

One epedimic of influenza occurred during the latter part of January extending into February, and was prevalent in all Ships and Establishments, 583 cases being notified.

The incidence fell heaviest in H.M.S.Ganges, with 282 cases, followed by R.M.Depot,Deal, with 107 cases, and R,N.Barracks, Chatham, with 66 cases.

The cases were all of the Catarrhal Type, mild and uncomplicated. One Gastric Type was notofied.

INFECTIOUS DISEASES.

NORE COMMAND.

1933.

DISEASE.	H.M.S.PEMBROKE.	M.T.ESTABLISHMENT.	NORE RESERVE.	R.N.HOSPITAL.	R.M.CHATHAM.	R.M.DEAL.	H.M.S.GANGES.	OTHER SHIPS.	FOREIGN INVALIDS.	TOTAL.
CEREBRO SPINAL MENINGITIS.	1.						3.	1.		5.
CHICKEN POX.	1.						2.	8.		11.
DIPHTHERIA.	1.						2.	3.		6.
DYSENTERY.	1.						1.	1.		3.
ENTERIC FEVER.						1.		1.		2.
ERYSIPELAS.							3.	4.		7.
ENCEPHALITIS.							1.			1.
INFLUENZA.	71.	19.	23.	19.	46.	108.	283.	41.		610.
MALARIA.	2.				1.		1.	1.		5.
MUMPS.		2.				2.	3.	6.		13.
PNEUMONIA.	16.	1.	1.	1.	3.		21.	9.		52.
RUBELLA.	6.						47.	2.		55.
SCARLET FEVER.	6.		1.				20.	4.		31.
PULMONARY T.B.	11.	1.	2.	1.	6.		2.	11.	14.	48.
OTHER T.B.	4				1.			4.	1.	6.
TONSILLITIS.	212.	69.	21.	11.	17.	32.	429.	13.		804.
UNDULANT FEVER.	1.									1.
ANTHRAX.	1.									1.
ACTINOMYCOSIS.							1.			1.
FOOD POISONING.	1.									1.
PULMONARY FIBROSIS.	2.								2.	4.
RHEUMATIC FEVER.			1.				9.			10.
WHOOPING COUGH.							1.			1.
MEASLES.	2.						9.			11.
TOTALS:-	335.	92.	49.	32.	74.	143.	838.	109.	17.	1689.

INFECTIOUS DISEASES

AMONG

LOCAL CIVILIAN POPULATION

Notifications of infectious diseases among the civil population as received from the Medical Officers' of Health for Chatham, Rochester, Gillingham and Sheerness in comparison with 1932.

The total incidence of disease is as follows:-

DISEASE.	1932.	1933.
CEREBRO SPINAL MENINGITIS.	10.	5.
DIPHTHERIA.	45.	91.
ERYSIPELAS.	25.	23.
ENTERIC.	22.	1.
MALARIA.	1.	1.
OPHTHALMIC NEONATORUM.	5.	9.
PUERPERAL FEVER.	13.	14.
POLIOMYELITIS.	4.	1.
PNEUMONIA. ALL FORMS.	61.	94.
SCARLET FEVER.	357.	494.
PULMONARY T.B.	140.	107.
OTHER T.B.	34.	20.
CROUP.	NIL.	1.

H.M.S. GANGES

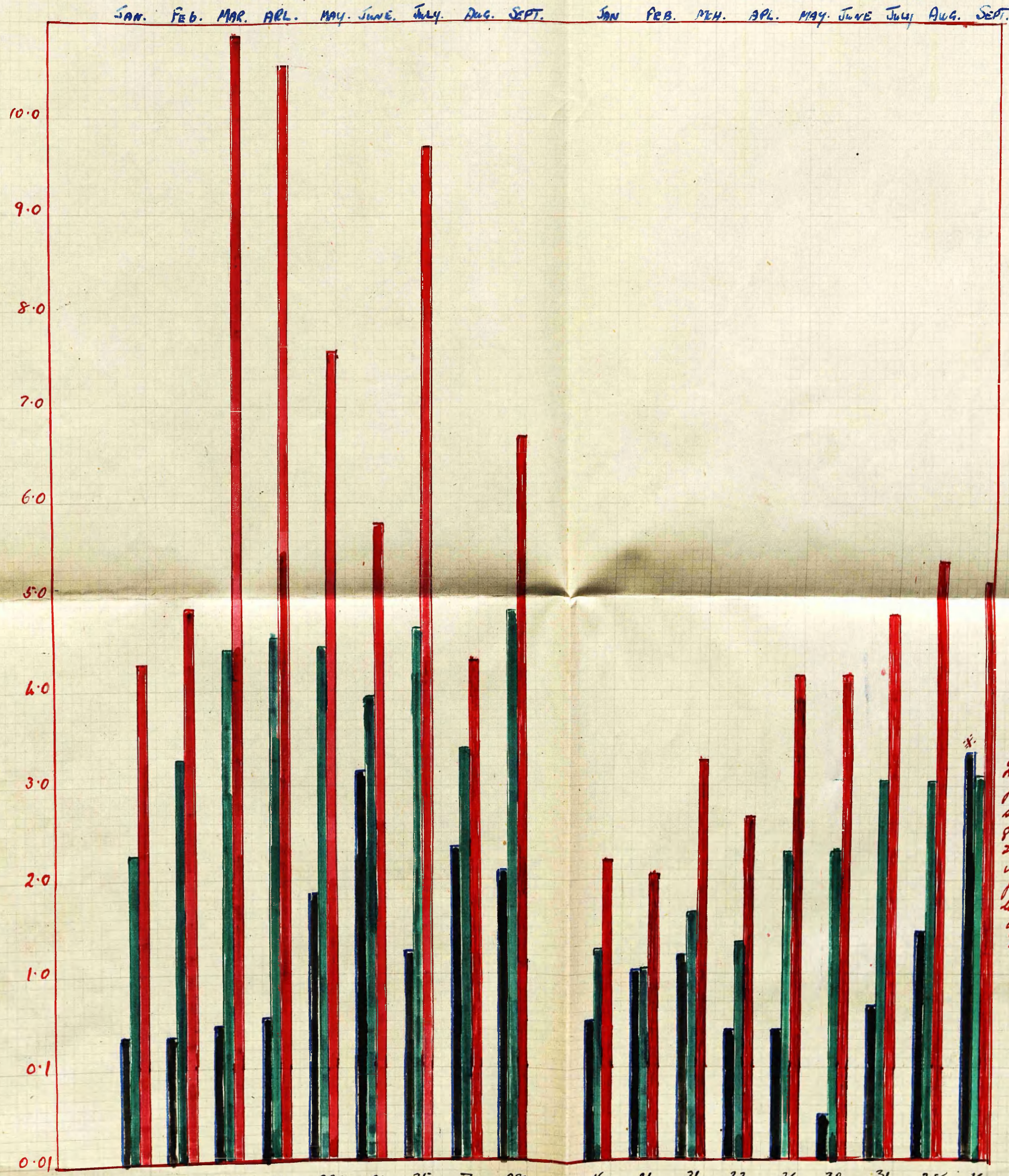
— SWIMMING BATH COMPARISONS. —

BATHING LOADS:- PERSONS USING BATH PER 1,000 GALLONS WATER DAILY.

1933.

— H.M.S. GANGES. —

— H.M.S. PEMBROKE. —



BATH CAPACITIES.

"GANGES" 62,580 GALS.

"PEMBROKE" 80,000 GALS.

BATHING LOADS.

HIGHEST:- RED

AVERAGE:- GREEN.

LOWEST:- BLACK.

In the case of H.M.S. "Pembroke" figures pour Friday to Sunday inclusive are given in the aggregate. The lowest actual load is taken from mid week figures, thus making the lowest known load appear higher than the average load.

No. days bath used during period.	11	28	28	21	28	28	35	7	28	16	21	31	22	26	30	31	28	16
Total no. persons entering bath during period.	1,572	5,728	7,846	5,979	7,857	6,920	10,270	1,486	8,489	1,481	1,745	3,774	2,515	4,778	5,524	7,526	6,917	3,490
Highest no. in one day.	268	304	678	653	473	360	607	270	424	176	163	258	213	330	332	384	430	412.
Lowest no. in one day	23	22	28	32	115	196	80	147	134	30	85	96	28	11	4	43	113	268.