

O'Dwyer

Intubation.

Read before the Wayne County (Detroit)
... Medical Society ...

... By ...

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INTUBATION.*

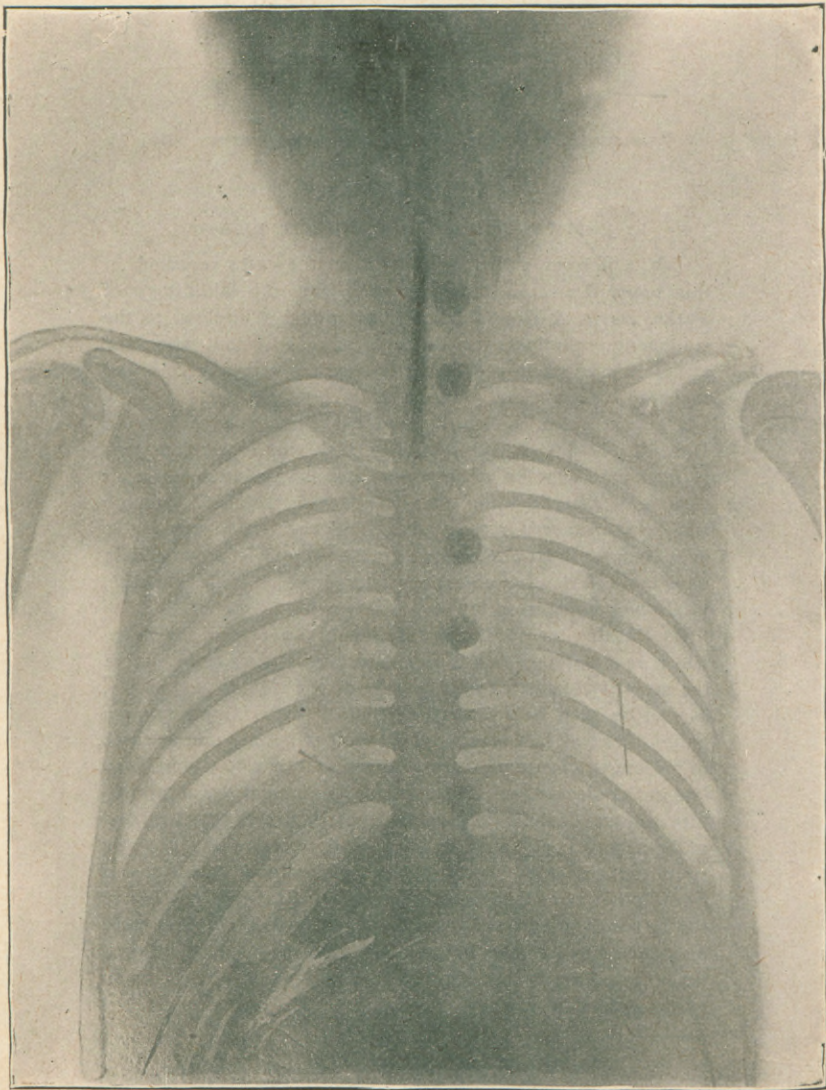
BY JOSEPH P. O'DWYER, M.D., DETROIT, MICHIGAN.

[Dr. O'Dwyer writes us that in all the cases reported in this paper the serum employed was from the laboratory of Parke, Davis, & Co. Particular attention is directed to the statement preliminary to the table of results, that when the antitoxin was employed before intubation recovery followed in every case but one.—P., D. & Co.]

Eighteen years ago intubation was a novel procedure in Detroit. To-day it is practically the only operation performed for the relief of laryngeal stenosis, whether acute or chronic. After passing the gauntlet of criticism, through which every operation must pass, it has been found superior in every respect to its predecessor, tracheotomy. In pre-antitoxin days there were a few objections offered, which justly, perhaps, might be reconsidered.

(1) Pushing or loosening of membrane before the tube which as a matter of fact is very rare, the stenosis being due in the majority of cases to infiltration of the submucous tissues, as can be seen by a transverse section of a larynx from a patient dead of laryngeal diphtheria. It is only met in cases of prolonged croup, or those wherein antitoxin has been used late in the disease, and is produced by traumatism or premature removal of the obturator, thus obstructing the tracheal end of the tube. It is easily recognized by a valve-like flapping sound accompanied by symptoms of extreme stenosis. If from this or any other cause air does not enter freely, the tube can be removed by traction on the thread, which should always be attached to the tube before attempting to insert it. Sometimes the withdrawal of the tube is accompanied by a portion of membrane, the removal of which gives the patient as marked

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Skiagraph of one of the cases described, showing tube in position. (By courtesy of Dr. J. Marker and S. Keenan, of the Wayne County Asylum.)

relief as the entrance of the tube. Foreign-body tubes have been used with some success in these cases, though the connection of diphtheritic serum with croup has practically smothered their value. If this complication should occur in the absence of a physician the tube may be removed by slightly inverting the patient and placing the finger over the tongue, or, in other words, causing emesis which expels the tube into the mouth, from whence it can be removed by the attendant. Some operators advocate the method of placing the thumb in the episternal notch and pressing upward, which, as you can readily see, requires considerable force to raise the tube from its resting place. Fortunately the light rubber tube over metal, used by most physicians, will be expelled by the child in case it becomes occluded.

(2) Feeding during the period of tubation, which many consider an objectionable feature, has been greatly exaggerated, as proven by the timely use of serum. Formerly it was said that particles of food entered the tube and produced pneumonia, but since the use of serum we see much less pneumonia, which undoubtedly, in most instances at least, was caused by infection. Although the effort of deglutition is accompanied by persistent coughing and only at first annoyance to the little patient, it is really of no consequence, though in fact sometimes of great value by causing the expulsion of membrane. I have yet to see a case, in antitoxin days at least, wherein it was necessary to resort to rectal alimentation. The most satisfactory position in which to feed a tubed patient is, probably, an angle of forty-five degrees, or in a reclining posture which allows the liquid nourishment to gravitate over the epiglottis, and although followed by some coughing at first, this gradually diminishes as the epiglottis adapts itself to the tube. The Casselberry method, which is preferred by many, I have not found very useful. It consists in placing the head lower than the body, most readily attained by elevating the mattress or foot of the bed, and, with the child on its side, administer the fluids from a small-mouthed cup, compelling the patient to swallow up-hill, so to speak. In the estimation of the average operator it makes little difference which position is followed,

as the paroxysms of cough consequent upon swallowing gradually disappear, providing the tube is adapted to the larynx; and I may say that the selection of a perfect tube is the most important part of the whole procedure, for without a well-fitting tube the physician will experience all measure of trouble, as has been the case in the past. All the so-called improvements are nothing more than distortions. The original hard rubber tube, which was discarded for use in children on account of its weight, which rendered it liable to be coughed out (though at that time it had no retaining swell), was replaced by a solid metal gold-plated tube which was used exclusively until two years ago. Since the use of antitoxin, which has materially shortened the tubation period, the hard rubber metal-lined tube is used by most operators, and is in every respect the ideal tube, being sufficiently light in weight to be expelled by the child in case the lumen becomes occluded, and yet requiring an extreme effort on the part of the child to dislodge it by coughing, as the retaining swell prevents the body from rising above the vocal cords, though if a small tube is used the child may expel it with ease. As this tube exerts much less pressure than the solid metal one, there is naturally less injury to the vocal cords and adjacent tissues, and, being free from calcareous deposits, which are almost always found on the surface of the metal tube, the voice is restored much earlier after extubation.

I recently saw a child who had been intubated for laryngeal diphtheria, but, instead of passing the tube between the cords, the operator pushed it through the left ventricle and down into the trachea. The little one progressed very nicely until the time came to remove the tube, which the physician could not find, and in his efforts to remove something that was not there set up an edema which threatened to be fatal. When I saw the child I was unable to locate the tube, which I knew to be present somewhere in the trachea on account of the metallic cough. After waiting several days for the swelling to subside, with the aid of the attending physician we inverted the child, and in that position I could feel the head of the tube against my index finger, and by mere good fortune the tube slipped

over the extractor and was removed without further difficulty. I make mention of this case to show that the loss of voice is not always attributable to the tube, but as in this case to an over-anxiousness on the part of the operator to relieve the stenosis. It is more surgical to make several gentle attempts, than to make one bold one which is almost certain to do irreparable damage. The period of tubation also has considerable effect upon the voice. In pre-antitoxin days the average was seven days. Under the present mode of treatment the average is four days and will, I think, be shortened to two days when we learn to use antitoxin earlier. In hospital practice, where assistance is at hand for any emergency, there is less danger in removing the tube, for should occasion arise it can be replaced. A great deal of stress has been laid on the time at which one should operate. The cardinal point is, how much serum has been used, and when. If within twenty-four hours after administering two thousand units the stenosis does not moderate, it is a safe plan to operate, unless in an unusually strong child, or when the disease is of short duration, in which case it would be safe to wait an extra twelve hours. In any case symptoms of progressive stenosis are always an indication for operation; but never, regardless of circumstances, postpone until the child is comatose from asphyxia.

The prognosis depends almost entirely on the amount of septic infection existing at the time of operation, eliminating of course such complications as pneumonia, nephritis, etc., which are liable to be present in the earliest stages of the disease. Providing the patient has had a large initial dose of serum (antidiphtheritic) within twenty-four hours after the advent of laryngeal symptoms, the probability is that the child will not require intubation, but in case it should, the operation will certainly be successful, and I feel safe in saying that ninety-five per cent. of these cases will recover. I would place it at one hundred per cent. were it not for the fact that complications coincident or consequent to the disease will claim at least five per cent. of the cases.

It has been verified by the report of the American Pediatric Society that in sixty per cent. of the cases of laryngeal diph-

theria intubation is not required, if reliable serum (antidiphtheretic) has been used in the first stage of the disease. In a total of 1704 laryngeal cases, there were six hundred and sixty-eight cases intubated. In the six hundred and sixty-eight cases there were one hundred and eighty-two deaths, or a mortality of 27.24 per cent. In the first report of the Society, in five hundred and fifty-three intubated cases the mortality was 25.9 per cent., an exceedingly good record, when the nature of such statistics is considered, including all manner of cases, the degrees varying from the use of serum on the first day of the disease to its administration on the last or fatal day, and in some cases not exceeding more than a few hours before death. These latter cases are the ones we see published as deaths from antitoxin or intubation. Conclusions are easily formed, but it is nevertheless an undisputed fact that with the serum first and the tube second (when necessary) laryngeal diphtheria becomes one of the most amenable of diseases that we are called upon to treat.

Before relating the results obtained by the combined treatment, to which method I have limited the report of the cases included in this paper, I wish to say a word in regard to a couple of unusually interesting cases occurring in the practice of Doctor Dulitz.

The first case was that of a boy, aged nine years, suffering from stenosis due to goitre. The growth made its appearance about three years previous, but did not have any noticeable effect upon the child's health until three weeks before we were called in. The mother consulted a prominent surgeon, who advised her to have the growth removed as soon as possible. She had already prepared for the operation, and would have had it performed the week following, were it not for the accident which necessitated the use of the tube. The family history presented what might be termed a goitre diathesis, all the members having suffered from the disease at some time or other during their career. Probably the most significant point of interest in the child's history was the fact that he never spoke other than to make certain sounds by which they understood his wants. In other respects he was bright and intelli-

gent-looking, though of small stature. When I reached the house, the child was limp and apparently breathless, and without the aid of the gag I easily inserted a five- to seven-year-old tube, an unusually small tube to use in any case with safety unless the stenosis is of a chronic nature. We applied restoratives and worked over the patient for at least ten minutes before there was much response of life. When he revived there was still considerable dyspnea, due no doubt to edema of the lungs, which continued to a greater or less extent for one week, during which time the temperature and pulse ran as in pneumonia, though all the physical signs of the latter disease were absent. The doctor put the boy under a general toning treatment, employing the iodide of potassium locally and with such marked improvement that at the end of two weeks I was able to remove the tube, which the little fellow wore with such convenience that he was able to partake of solid food quite liberally several days previous to its extraction. The growth has almost entirely disappeared, and the little fellow appears much stronger than before, though the doctor tells me that his voice is much the same as when he first saw him about three years ago.

The second case was that of a boy aged six years, who had been suffering from a spasmodic, croupy cough for a couple of weeks, which was attributed to the swallowing of a safety pin. The mother consulted the family physician, who examined the throat carefully, but found nothing to account for the croupiness except a slightly congested condition of the glottis. The ordinary remedies having failed to give any relief, the physician procured a culture from the upper part of the larynx, which was negative—not an unusual occurrence in true laryngeal diphtheria. The patient began to fail in strength, presented some fever, was croupy all the time, and subject to violent paroxysms of cough, but suffered little inconvenience in breathing until the second week. I was called in by the doctor at the end of the second week, on account of the gradually increasing dyspnea. Under the circumstances a laryngoscopic examination was out of the question, as the youngster would submit to nothing. Upon exploration of the upper por-

tion of the larynx with the finger, I was positive that I could feel the spiral end of the pin, but when I made an attempt at extraction it had apparently disappeared. During this interval the dyspnea, which was severe, did not improve, and we felt quite certain that unless the child obtained more air in a very short time he would die. I inserted a regular-sized tube, five to seven, and to my surprise without meeting resistance, and with the same pleasing relief we are so accustomed to see in cases of diphtheritic stenosis. The doctor saw the child regularly, and as nothing further developed I concluded to remove the tube, which I did on the fourth day, after which the child could breathe as well as ever, though he still retained the croupy cough. An examination of the throat and chest was negative. The recovery was uneventful, and three weeks later he coughed out the pin open, which was a medium sized safety pin and no doubt lodged in the trachea, the stenosis being due to edema of the parts above the pin.

The following report is a synopsis of thirty-one cases intubated during the past two years for stenosis due to laryngeal diphtheria, wherein the operation was either preceded or followed by the administration of antidiphtheritic serum. We will first consider the cases intubated prior to the use of antitoxin. I have placed them in tabulated form, so the number of each case will correspond with the number in the table:

Case 2.—A girl, aged nine years, had suffered from an attack of tonsillar and pharyngeal diphtheria for four days previous to the onset of laryngeal symptoms. Besides the ordinary treatment, antiseptic inhalations were resorted to; but as the case progressed the symptoms became more alarming. I was called by the attending physician on the morning of the third day of laryngeal involvement. The child was then suffering from sepsis with broncho-pneumonia. After operating I suggested the use of two thousand units of serum, which was given about noon, the child dying seven hours later, or about sixteen hours after intubation.

Case 3.—A well developed lad of five years, presented croupy symptoms two days previous to my visit, when his condition gave every evidence of being diphtheritic on account of the

gradually increasing stenosis. Immediately after operating, with the consent of the family physician, I injected one thousand five hundred units of antitoxin serum, and thirty-six hours later he expelled the tube, and progressed fairly well for about one week, when paralysis set in, which caused his death ten days later, in spite of the most thorough treatment.

Case 7.—A girl, aged four years, had been suffering four days from laryngeal diphtheria, at the end of which time I intubated, and advised the immediate use of two thousand units of serum, which was given as soon as procured. The following day the child was much improved, but during the evening she developed pneumonia, caused from extended infection, and died the day following.

Case 11.—A boy, six years old, recovered from an attack of tonsillar diphtheria, when suddenly one week later he developed a very severe attack of croup, and as the stenosis became dangerous intubation was performed, the attending physician using one thousand five hundred units of antitoxin serum a few hours later. He made an uneventful recovery after having worn the tube for four days.

Case 15.—A baby girl, aged ten months. A physician was called when the child was cyanosed and in a moribund condition, and therefore intubation had to be performed immediately. One thousand five hundred units of antitoxin were used, but the child died sixteen hours later of sepsis.

Case 14.—A female, aged ten months, developed croupy symptoms twenty four hours before a physician was summoned. Intubation, urgently required, was performed, five hundred units of serum were administered and another five hundred units were employed later; but, contrary to expectations, the child died of septic pneumonia fourteen hours after the operation, with a temperature of 106° in the axilla. This case I have little doubt was of longer duration, and had we used two thousand units of serum the result might have been different.

Case 21.—A girl, aged one year, presented symptoms of laryngeal diphtheria for three days, at the expiration of which time intubation became necessary. After the operation we

gave one thousand units of serum, but in spite of all our efforts she grew gradually weaker, and died thirty-six hours later of sepsis.

Case 23.—The patient was a bright, healthy young girl of seven years, who developed diphtheritic laryngeal stenosis two days prior to intubation. Immediately after the operation we injected two thousand units of antitoxin serum. She progressed nicely and wore the tube well for two days, after which she developed a severe pain over the cardiac region, and began to suffer from dyspnea, which the parents thought was due to the presence of the tube, and at their command I was compelled to remove it, though the patient died three hours later of paralysis of the heart.

Case 25.—A boy, aged two years, had been suffering from diphtheritic croup for four days. When operated upon his condition was extremely unfavorable. The physician administered one thousand five hundred units of serum, but on account of the septic condition of the system it could have little effect, and consequently the child died the following day.

Case 26.—A delicate and anemic boy of five years, had been suffering from an attack of pharyngeal diphtheria, which was apparently improving, when he developed laryngeal symptoms, which he had for four days before I had occasion to operate upon him. We gave him one thousand five hundred units of antitoxin serum, after which he made a rather slow recovery, wearing the tube for seven days.

So much said for those who hesitate. We will now consider the cases wherein the serum was used with the hope of warding off intubation, and although the operation was necessary in each instance, the invaluable good of antitoxin and its part in the prognosis of the operation will be appreciated.

Case 1.—A boy, aged two years, was suffering from laryngeal diphtheria for three or four days. The first physician in attendance had used about fifteen minims of antitoxin. The remainder was on the table in the original package, the parents refusing to allow him to use it, for reasons they failed to make clear. The second physician not knowing the circumstances called me to intubate, which I did, with immediate relief to the

child, but the family would not consent to the employment of antitoxin. The tube remained *in situ* for a week, and one evening, in the absence of the attending physician, they sent post-haste for me and demanded that I produce the tube immediately. Circumstances would permit of no alternative, and against my wish I removed the tube and told them the child would live about two hours. It was scarcely an hour when they were after me, but as they would allow me to use neither antitoxin nor the tube I told them I certainly would not go. The regular physician being out of the city, the parents called in a doctor who gives pronuclein for everything, with the usual result, as he explained the constituents of the preparation to me, that the child recovered.

Cases 4, 5, and 6.—These are so nearly alike that they may be classed together. In each instance upon the second day of laryngeal symptoms, each child received one thousand five hundred units of serum (antidiphtheritic), but as the stenosis increased surgical interference became necessary. Each child wore the tube four days, making a good recovery.

Case 8.—A boy, aged two years, developed an attack of laryngeal diphtheria during the course of scarlatina. He had been suffering from the latter disease some ten days before the laryngeal trouble set in. Many contend that this form of laryngitis is not diphtheritic, rather membranous, but we all, no doubt, have from experience become impressed with the malignant nature of the trouble, and I am pleased to say that from my experience at least antitoxin is equally efficient as when the trouble occurs independently of the exanthem. One thousand five hundred units of antitoxin were administered on the second day of croup, and later in the day intubation was performed, the little fellow recovering rapidly four or five days later.

Cases 9 and 10.—These resemble each other so much that they may be classed as one, in that they both received a large initial dose of serum early in the disease, and, although in Case 9 it was necessary to repeat the dose, both cases recovered rapidly after having worn the tube the accustomed period.

Cases 13, 16, and 17.—These are much the same, as each patient received two thousand units as the initial dose, which many consider the smallest dose applicable to a well-marked case of laryngitis, whether diphtheritic or membranous. These little patients all recovered after the usual length of time without developing symptoms of particular interest.

Case 12.—I had almost overlooked the case of this little girl of two and one-half years of age. She had suffered an attack of pharyngeal diphtheria, upon which two one thousand five hundred unit doses of serum were used with apparently good effect. Four or five days later, however, it extended into the larynx, and another one thousand five hundred units were administered but with little effect, as the child required the tube the day following. The patient progressed favorably for three days or more, when she developed an unusually high temperature, which upon examination proved to be due to bronchopneumonia. We removed the tube, administered the fourth one thousand five hundred unit dose of serum, besides employing the usual remedies and giving strychnine freely, but despite all efforts she died just three weeks after the original attack. The urine contained quantities of albumin, and the membrane extended forward on the tongue and lips, even after the fourth dose of serum had been given. This is one of those cases that a physician occasionally meets, wherein serum seems to be almost useless. There is reason to believe that the serum used was as good as any in the market.

Case 18.—That of a girl, aged five years. She was cyanosed and almost pulseless when operated upon, though two thousand units of serum had been administered the same day, about twelve hours previous. This case was one of four or five days' duration. Twenty-four hours after intubation she coughed the tube out, which is not an uncommon occurrence a few hours after a large dose of serum has been given late in the disease. The girl recovered without further need of the tube.

Cases 19 and 20.—These were unusually protracted cases with high temperature and general septic infection. The physician used three one thousand five hundred unit doses of

serum in Case 19, and yet on the fifth day it was necessary to operate. Case 20, a girl of seven years, was one of the most stubborn cases I ever saw. One thousand five hundred units of antitoxin were given at the onset, but symptoms became so severe it was necessary to use the tube. During the tubation period of six days we gave three two thousand unit doses of serum with such good effect that the patient recovered.

Cases 22 and 24.—Each received one thousand five hundred units on the second day. Intubation was performed in each instance late on the second day of the disease. Both patients recovered, having worn the tube three and four days respectively.

Cases 27, 28, 29, 30, and 31.—These are very similar, differing only in degree and duration. The oldest patient, who was six years, and the youngest one received alike one thousand five hundred units, and in only one case was it necessary to repeat the dose. In one child two years of age the disease existed six days before serum was used, and yet the patient made a fair recovery after having worn the tube six days without further employment of serum.

My object in dividing the cases as I have is to show, or rather prove, the advantages of the early use of serum, more especially in connection with intubation. Of the first ten cases just related, or those wherein intubation preceded the use of antitoxin, eight died and only two recovered. Of the twenty-one cases treated in the proper manner, namely, by antitoxin first and intubation later, only one died, or a mortality of 4.77 per cent., against 80 per cent. by the former method, giving a total mortality of 29.03 per cent.

Intubation is a simple means of combating an emergency, the gravity of which we all understand. Those of the profession who have stood by the bedside of a little patient suffering from stenosis due to laryngeal diphtheria, or, in fact, to any cause, and witnessed the great relief that comes to him after the entrance of the tube, and the expression that beams forth from the little one's eyes, can most appreciate the incomparable value of the operation, especially valuable when used in conjunction with that God-sent remedy, antitoxin.

Physician.	Case Number.	Male.	Female.	Age.	Duration of Disease when Intubated.	Amount of Serum.	Operation before use of Serum.	Operation after use of Serum.	Period of tubation.	Complications.	Cause of Death.	Result.
W. J. Brand...	1	I		2 y	5 d	500		A	7 d	seps		R
" "	2		I	9 y	3 d	2000	B	A	16 h	seps		D
" "	3	I		5 y	2 d	1500	B		36 h		paral's	D
E. Z. Rodd...	4	I		5 y	2 d	1500		A	4 d			R
K. Dubpernell.	5	I		4 y	3 d	1500		A	3 d			R
G. P. Johnson..	6	I		5 y	2 d	2000		A	4 d			R
H. A. Wright..	7		I	4 y	4 d	1500	B		2 d	seps—pneu		D
W. C. Kitchen.	8	I		2 y	3 d	1500		A	4 d	scal'na		R
T. J. Parker...	9	I		16 m	2 d	2150		A	5 d	bron		R
F. N. Henry...	10	I		2 y	3 d	1500		A	4 d			R
W. J. Cree....	11	I		6 y	3 d	1500	B		4 d	bron		R
W. C. Stevens.	12		I	3 y	2 d	3150		A	7 d	bron-pueu		D
" "	13	I		7 y	3 d	2000		A	4 d			R
" "	14		I	10 m	1 d	500	B		14 h	bron-pneu		D
P. C. Dulitz...	15	I	I	10 m	3 d	1500	B		16 h	seps		D
" "	16	I		5 y	2 d	2000		A	3 d			R
" "	17	I		6 y	3 d	2000		A	4 d			R
" "	18		I	5 y	4 d	2000		A	1 d	cough'd out		R
" "	19	I		3 y	5 d	3350		A	5 d	bron-pneu		R
" "	20		I	7 y	4 d	4200		A	6 d			R
J. B. Kennedy.	21	I		1 y	3 d	1000	B		36 h	seps		D
" "	22		I	4 y	3 d	1500		A	4 d			R
" "	23		I	7 y	2 d	2000	B		2 d		paral's	D
G. S. Kennedy.	24		I	3 y	2 d	1500		A	3 d			R
N. L. Sage....	25	I		2 y	4 d	1500		B	1 d	seps		D
N. F. Brown...	26	I		5 y	4 d	1500	B		6 d			R
Own case.....	27	I		6 y	2 d	1500		A	4 d			R
" "	28	I		2 y	6 d	1500		A	7 d			R
" "	29		I	4 y	3 d	2000	2		5 d			R
" "	30	I		1 y	2 d	1500		A	3 d			R
" "	31	I		4 y	2 d	1500		A	3 d			R

31/ 90/29
62
280

