

THESIS

ON

SOME RESULTS OF TREATMENT

AS ILLUSTRATED BY THE SPHYGMOGRAPH

BY

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Glasgow 1899

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SOME RESULTS OF TREATMENT

AS ILLUSTRATED BY THE SPHYGMOGRAPH

The first attempt at estimating and demonstrating the pressure of the blood in the vessels was made in the year 1827 by a clergyman called Hales, an amateur vivisectionist, who inserted a straight glass tube into the femoral artery of a horse, and noted the height to which the blood rose, and the oscillations which took place, in response to each beat of the heart. In 1828 Poiseuille repeated the experiment, but employed a bent tube partially filled with mercury, calculating the force of the heart by the height to which the mercury rose in the tube; and somewhat later Vierordt improved upon this by inserting a solution of sodium

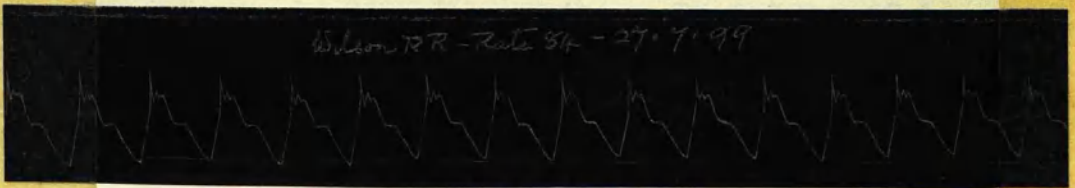
carbonate between the blood and the mercury, thus preventing coagulation. Soon after this, Ludwig went a step farther, and placed a float, to which a marker was attached, on the surface of the mercury, transferring its oscillations to a strip of paper stretched upon a revolving drum, the result being a series of up and down straight lines. The experiment was repeated by several others in various ways, but it was not until 1855 that a system of levers was substituted for the column of fluid, by Vierordt, and the first graphic representation of the pulse obtained. It is curious to note however that Vierordt at first regarded the little waves on the downstroke, which to us are so important, as being adventitious, and his endeavour was to obliterate these by altering the pressure, considering the series of up and down straight lines thus obtained as being the correct tracing. Improvements upon Vierordt's instrument soon appeared, the chief of which now in use being Mareys, (as modified by Mohamed, Byrom Bramwell

and others) Ponds, and Dudgeons, the respective merits of which it is not proposed to discuss.

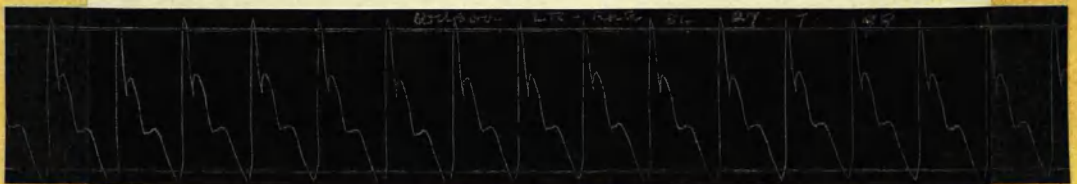
The value of the instrument in medicine has been variously estimated by different observers. Some consider it an aid to diagnosis, prognosis, and treatment - a valuable addition to the clinician's armamentarium - while there are others, and of these not a few, who regard it not only as useless, but misleading. The main arguments put forward against its utility are that it shows nothing that could not have been detected by the educated finger; that the character of the tracing varies according to the amount of pressure applied, or in other words that almost any variety of tracing can be obtained from the same pulse by a mere alteration in pressure; and lastly, that it is useless in the diagnosis of individual cardiac lesions.

While it is true that the experienced finger can estimate correctly the majority of

pulses, the tactus eruditus necessary to attain such proficiency is acquired only after considerable practice, and it is by adding the sense of vision to that of touch that the sphygmograph plays an important rôle in clinical teaching. There are, moreover, instances where the sphygmograph aids in the diagnosis of thoracic aneurism, but, as the fallacies connected with its use in this condition are many, only gross differences in the tracings obtained from the two pulses can be relied upon, and the educated finger is then capable of serving the same purpose. The following two tracings were taken from a case of aneurism of the ascending part of the aortic arch.



Right Radial.



Left Radial.

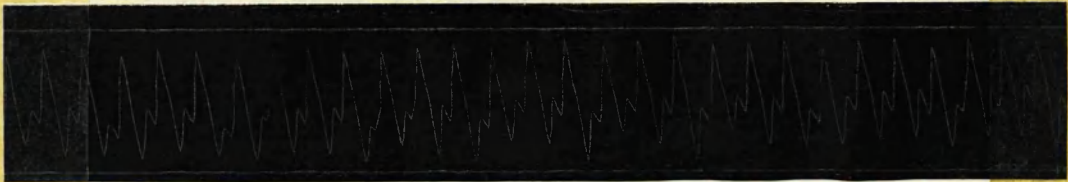
The diminution in volume, and the deformity of the percussion wave of tracing No. 1, which was taken from the right radial, are well marked, but the instrument was not absolutely necessary to detect this, as the difference in the volume of the two pulses was quite perceptible to the finger. The utility of the sphygmograph in respect to thoracic aneurisms is more for obtaining precise records and investigating future changes^x. Again, in the early stages of chronic interstitial nephritis where the symptomatic manifestations are obscure, as is frequently the case, the employment of the sphygmograph is often of service in detecting a slight increase in arterial tension imperceptible to the finger, and yet of considerable importance in the diagnosis. In pulses of low tension the degree of dirotism is determined by the sphygmograph, and thus the severity of the case more easily gauged. The three degrees

^xSansom - The diagnosis of diseases of the heart and thoracic aorta.

dicrotism, full dicrotism, and hyper dicrotism,
are here represented.

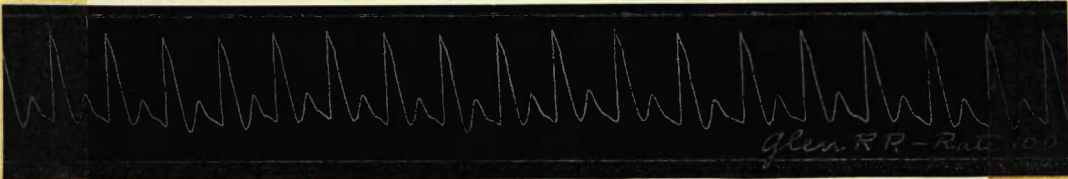
Figure 2.

No 1



Hyper. Dicrotism.

No 2



Green RR - Red 100

Full Dicrotism.

No 3



White RR - Red

Dicrotism.

That the sphygmograph is capable of producing any variety of tracing according to the pressure employed is an argument that can hardly prove of much value, for, to those who have made themselves thoroughly acquainted with the subject it suggests both a want of experience and a want of skill in the application of the instrument. By altering the pressure and watching the swing of the needle, it becomes a comparatively easy matter to recognise the conditions requisite to give a true record, and, moreover, a glance at the tracing after it is taken is sufficient to decide its value.

With regard to the value of the sphygmograph in the diagnosis of individual cardiac lesions Mahomed^x maintains that a diagnosis of heart disease from the inspection of a sphygmographic tracing must, in by far the greater proportion of

^xThe Medical Times, 1872, Vol. I

cases, prove a complete failure, and in support of this statement a few illustrations are now submitted.

Figure 3.

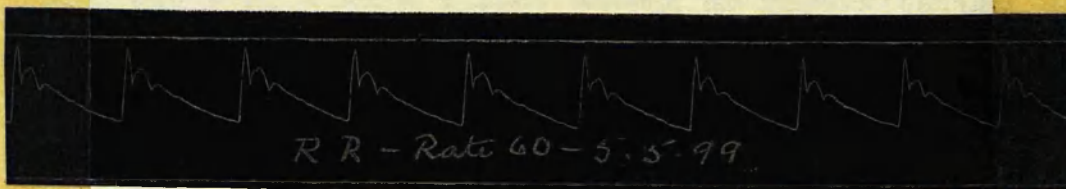
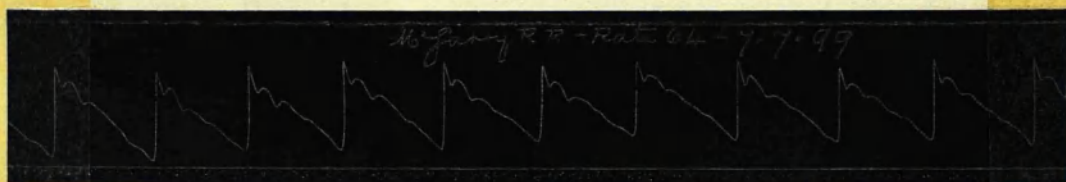


The appearance of this tracing does not suggest a serious case of heart disease, the pulse is regular, and the tension well sustained, yet it was taken from a case the physical signs of which clearly pointed to congenital pulmonic obstruction. The patient was a girl aged six, and curiously enough the condition was discovered quite by acci-

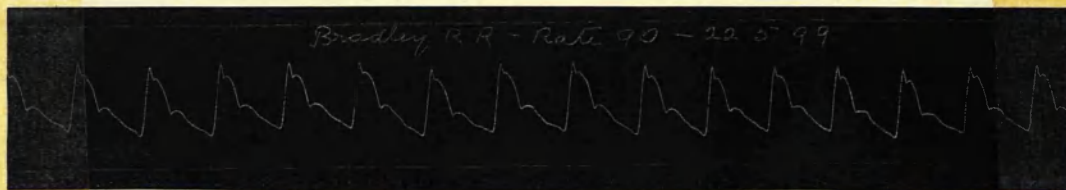
dent. Owing to an attack of measles three or four months prior to coming under observation, she became an inmate of Govan Fever Hospital, where the cardiac condition was detected. The child was able to play with other children, and keep up with them in their games, though the mother admits to having noticed her somewhat blue and unduly breathless after exercise, but this was so slight that she paid no attention to it. Upon examining the heart the apex was found in the fourth interspace $3\frac{1}{2}$ " from mid-sternum, and the precordial dulness was bounded above by the second rib, to the right by a line $1\frac{1}{2}$ " to the right of mid-sternum, and to the left by a line 4" from mid-sternum. Transverse measurement $5\frac{1}{2}$ ". A thrill, systolic in rhythm, was present, fairly well localised to the pulmonic area; a thrill, intensely rough in character, so rough indeed that the "fremissement cataire" of Laennec, was at once suggested. Associated with this was a systolic murmur, which, though heard all over

the precordium - at the pulmonic area, was actually painful to the ear.. The absence of symptoms in this case was rather unusual, but compensatory hypertrophy had evidently been sufficient to overcome the obstruction, and this was further suggested by the increased dulness, and the loud character of the murmur, pointing to the fact that a powerful ventricle was acting.

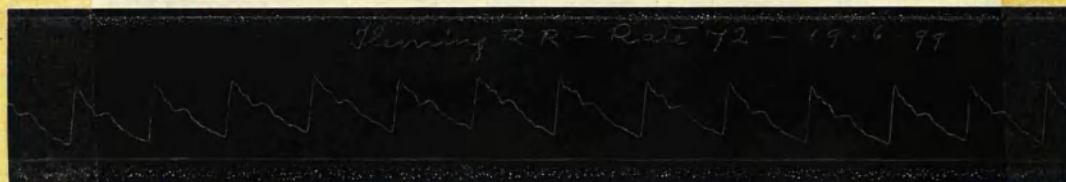
Figure 4.



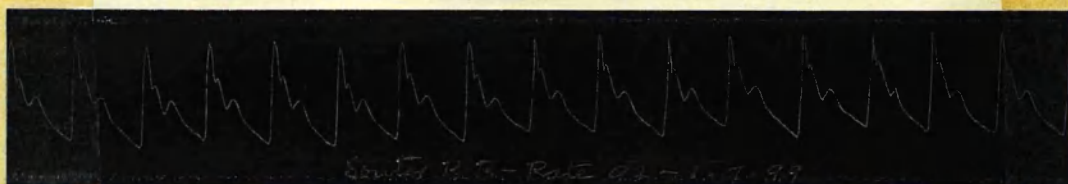
No 3



No 4



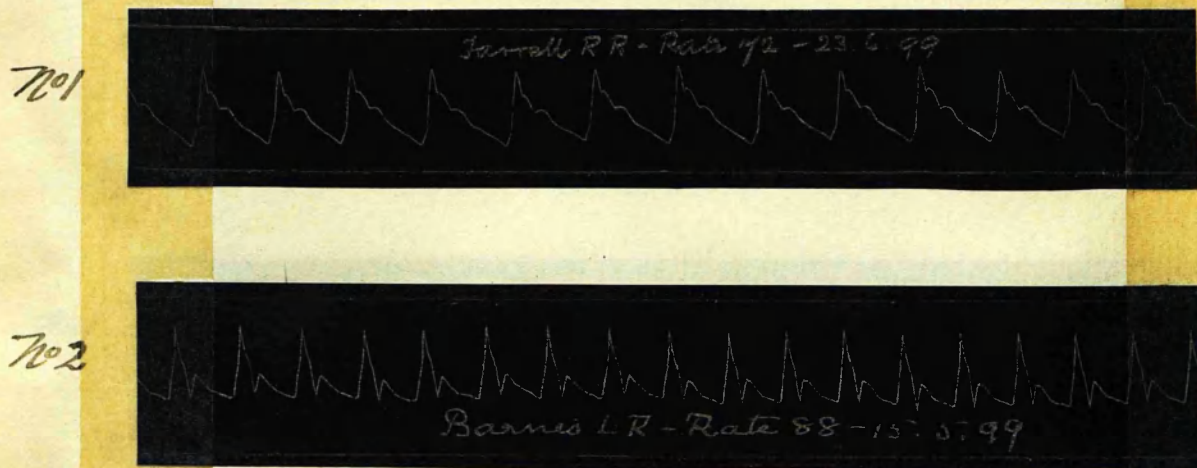
No 5



The sphygmograms in Figure 4 were taken from cases of mitral stenosis Nos. 1, 2, and 3 as indicated by the physical signs representing that condition uncomplicated, Nos. 4 and 5 being associated with a slight amount of regurgitation, the obstructive lesion however being the prominent feature. In only two of these cases were there cardiac symptoms, and then only slight breathlessness on exertion, the remainder being detected in cases

of hemiplegia of embolic origin, and in rheumatism where there had been previous attacks. Not the slightest hint of valvular flaw is derived from inspection of these tracings, in fact an attempt at diagnosis from them alone points rather in the other direction.

Figure 5.

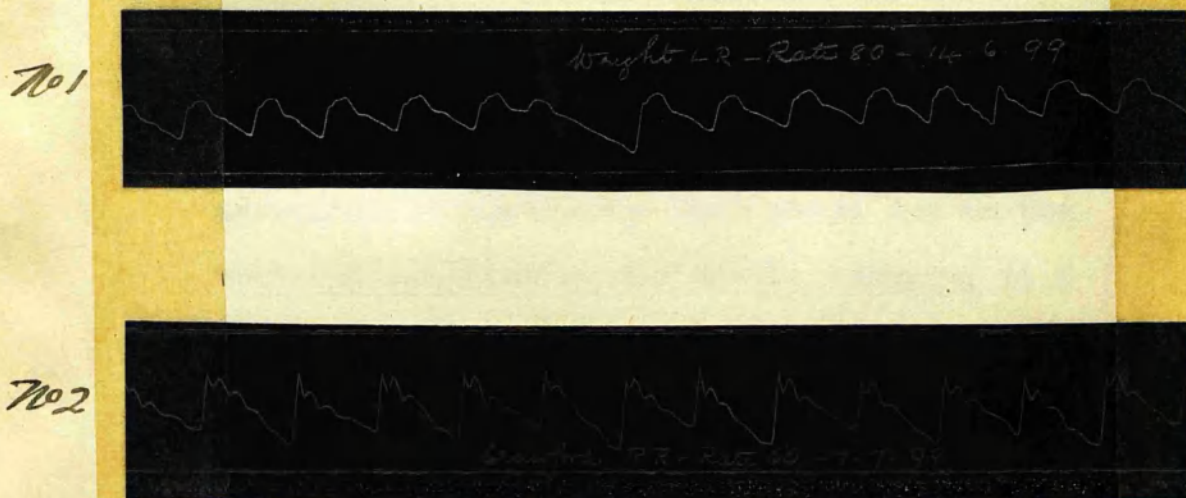


The pulse of mitral regurgitation has likewise no special characters. The tracings in Figure 5 were taken from cases of this nature; No. 1 would pass for a perfectly normal tracing,

while No. 2 indicates merely a pulse of low tension, a tracing that might be derived from a case of low tension from any cause.

As far therefore as the diagnosis of mitral lesions is concerned the sphygmograph lends no assistance whatever. With aortic lesions, however, it is somewhat different - aortic stenosis gives a tracing that is said to be characteristic, and so indeed it is in some cases, but not in all.

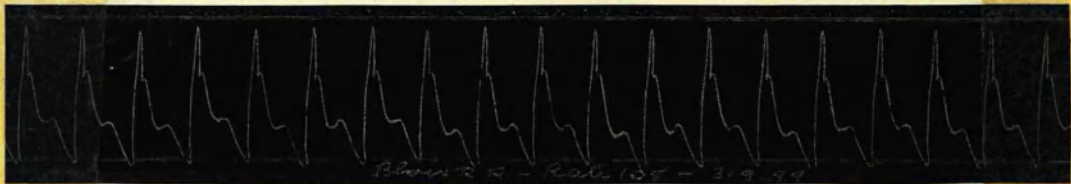
Figure 6.



The tracings in Figure 6 were taken from two cases of marked aortic obstruction with very slight evidence of regurgitation. The anacrotic nature, with the rounded top of tracing No. 1, is typically characteristic, while No. 2 which was taken from a very similar case has little of the anacrotic characters. The fact is that in no valvular condition is fallacy more likely to enter, owing to faulty adjustment of the instrument, than in aortic stenosis. In consequence of the obstruction at the root of the aorta the cardiac contraction is prolonged, and the distension of the artery more gradual than is normally the case. The spring on the instrument is therefore slowly raised instead of receiving a sharp impulse, and assuming the percussion wave to be due to the velocity acquired by the needle carrying it a little too far, it will be understood how in aortic stenosis it may be absent entirely, or if only diminished, how easily it may be obliterated by misapplied pressure. There are undoubtedly

cases where the percussion wave is practically absent, of which tracing No. 1 may be taken as an example, and there are also cases where it is apparently absent, but where perseverance will ultimately produce a katarotic tracing. Tracing No. 2 was obtained only after many attempts, all of which showed a marked degree of anacrotism.

Figure 7.



With regard to aortic regurgitation a tracing having special characters is also obtained, Figure 7. During the recoil of the aorta the tendency of the blood to flow back to the ventricle as well as onwards, normally, closes the

aortic valve, but if this valve is incompetent part of the blood returns to the left ventricle. The ventricle, then, is fed, not only by the left auricle, but also through the incompetent valve, and to hold this extra quantity of blood it has to dilate, and this dilatation is accompanied by hypertrophy. This large quantity of blood is at the next contraction thrown forcibly by the hypertrophied ventricle into the aorta, and the result is a very sudden ascent of the sphygmographic lever, but as the arterial system is open at both ends this is followed by as sudden a fall, the pulse in other words is unsustained. The percussion wave is high and pointed except in those cases of aortic reflux due to atheroma, but the leading character of the diastolic part of the tracing is the loss, or relative loss of dicrotism. Though this character of tracing is always given by this valvular lesion, yet there are occasionally conditions where tracings having very similar characters are obtained, and no aortic regurgitation

present, but these can usually be recognised by inspection of the diastolic portion of the tracings.

Many of the foregoing tracings have been taken from cases where the obstruction to the circulation has been overcome by compensatory hypertrophy. The heart has adapted itself to its altered circumstances, and the pulse therefore gives no expression of the serious structural alteration that has taken place. But the amount of hypertrophy that a heart is capable of undergoing is limited, and usually sooner or later the maximum is reached. Its place is then taken by dilatation, and the serious results of that condition now become manifest. They may be spoken of generally as irregularity, tachycardia, and alteration of tension. The indications afforded by the sphygmograph in valvular lesions are summed up by Mahomed^x in the following way.

^xThe Medical Times 1872, Vol. 1

- 1 It often affords reliable grounds on which to form a prognosis.
- 2 It is a measure of the amount of valvular lesion, and its effect on the circulation generally.
- 3 It indicates the extent to which the heart has accommodated itself to existing circumstances by compensatory hypertrophy, or whether unable to perform the increased work thrown upon it, it has become dilated.
- 4 By its aid the progress of cardiac disease may be estimated.
- 5 It is a most important guide to treatment and by it the action of a remedy may be watched in a most perfect manner.
- 6 It often affords an aid to diagnosis, though for this purpose it should be used with the greatest caution.

The foregoing introduction to this paper has dealt with the wide subject of sphygmography in general terms only. The history and description of the gradual evolution of the instrument have been brief, and the subsequent discussion, which has been approached impartially, and which might be carried to unlimited length, spoken of in as few words as the exigency of the situation de-

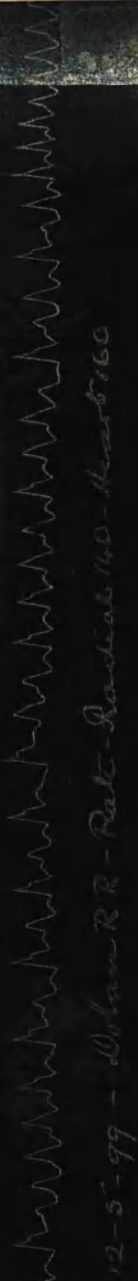
mands. It is now proposed to point out at greater length, by series of tracings, special references to the following points:-

- 1 The utility of the sphygmograph as an aid to memory.
- 2 The means it affords of obtaining indelible records of the pulse from day to day.
- 3 How the effect of treatment can be watched and recorded, and a prognosis more easily arrived at.

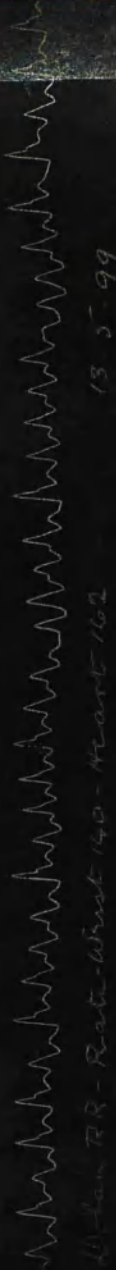
The first of these series is a particularly interesting one. The tracings have been taken from day to day, and in order that the continuity presented by the whole series should not be interrupted the tracings appear first, and the description follows.

Figure 8.

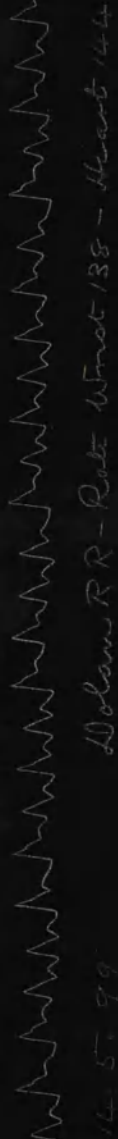
No 1



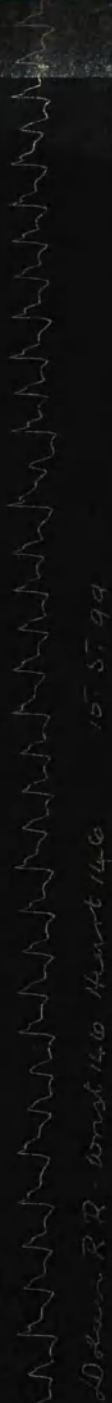
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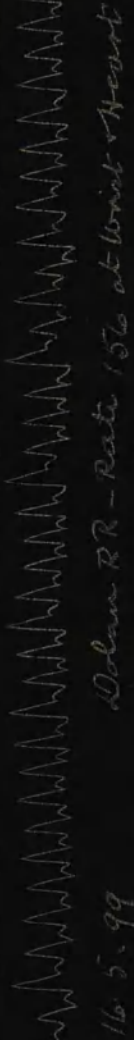
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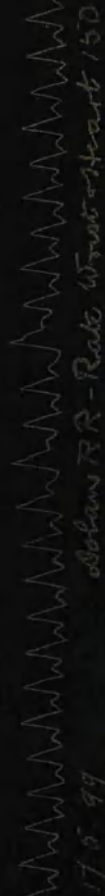
No 4



No 5



No 6



No 7

Dolan RR - Rate West + Heart 160 - 18.5.99

No 8

Dolan RR - Rate West + Heart 160

No 9

20.5.99
Dolan RR - Rate West + Heart 160

No 10

Dolan RR - Rate 160 - 21.5.99

No 11

Dolan RR - Rate 160 - 22.5.99

No 12

Dolan RR Rate 160 - 23.5.99

No 13

Dolan RR - Rate 160 - 24.5799

No 14

Dolan RR - Rate 160 - 25.5799

No 15

Dolan RR - Rate 160 - 26.5799

No 16

Dolan RR - Rate 172 - 27.5799

Acoustic
comments

No 17

Dolan RR - Rate 160 - 28.5799

No 18

Dolan RR - Rate 90 - 29.5799

No 19

Dolan RR - Rate 86 - 30.5.99

No 20

Dolan RR - Rate 84 - 31.5.99

No 21

Dolan RR - Rate 72 - 1.6.99

No 22

Dolan RR - Rate 70 - 2.6.99

No 23

Dolan RR - Rate 68 - 3.6.99

Greenish stamped.

No 24

Dolan RR - Rate 73 - 4.6.99

Dolan RR - Rate 70 - 5.6.99



No 25

Dolan RR - Rate 72 - 7.6.99



No 26

Dolan RR - Rate 70 - 6.6.99



No 27

Dolan RR - Rate 80 - 8.6.99



No 28

Dolan RR - Rate 80 - 9.6.99



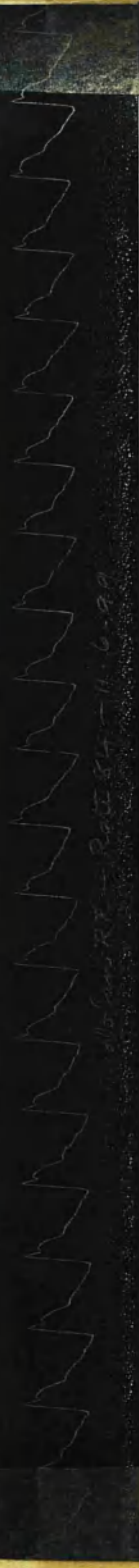
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Dolan RR - Rate 74 - 10.6.99



No 30

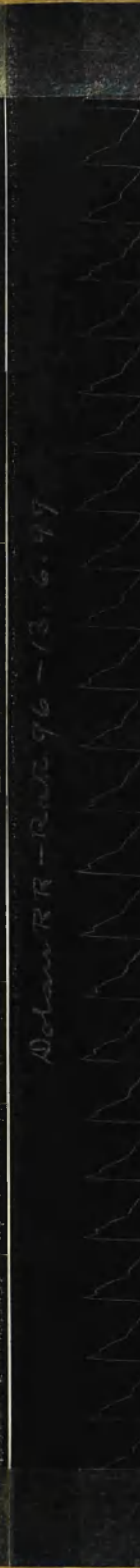
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No 32



No 33



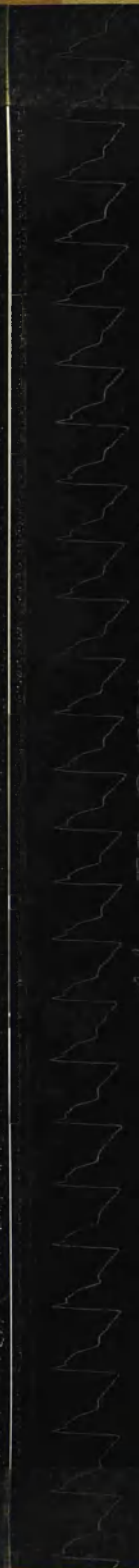
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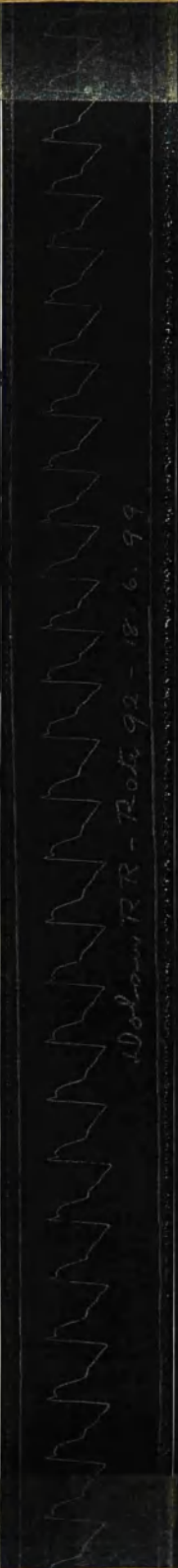


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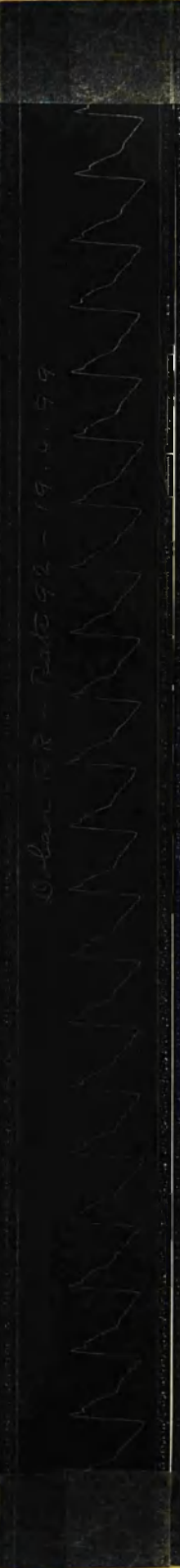




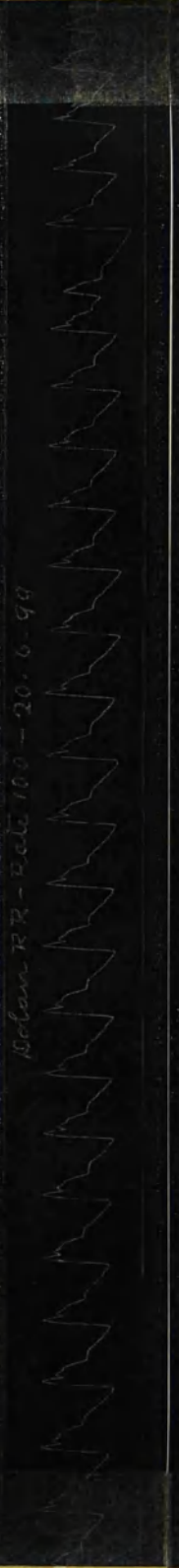
No 37



No 38



No 39



No 40



No 41

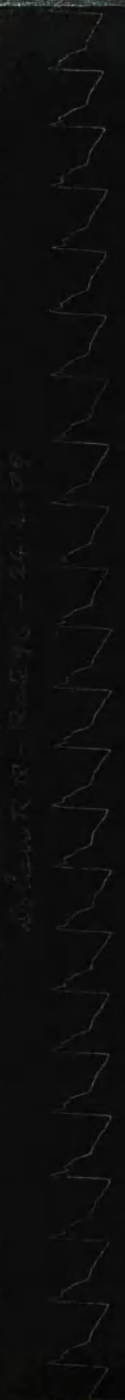


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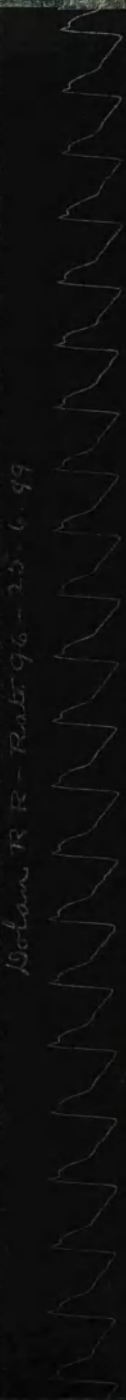
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HELEN D., aet. 35, Millworker, was admitted into the Western Infirmary on May 13th 1899 suffering from acute rheumatism with cardiac symptoms of six weeks' duration. There was a history of a previous rheumatic attack three years before, which confined her to bed for three months, but from which she apparently made a good recovery, and up to the onset of her present illness she enjoyed good health. Her present symptoms she dated from the beginning of April at which time she became the subject of pains in her joints, associated with dyspnoea on exertion, palpitation, and precordial pain. Upon admission the rheumatic manifestations were fairly well marked, the temperature reaching 102.8 that evening. The pulse at the wrist was irregular, small, and of low tension, numbering 140, while at the heart 160 beats were recorded. Examination of the heart revealed the apex ^{best} diffuse in character, visible and ^{palpable?} tangible in the fifth interspace 4" from mid-sternum, while pulsation was also evi-

dent in the fourth. A well marked thrill preceded the first sound. The precordial dulness was bounded above by the third interspace, to the right by the left sternal margin, and to the left by a line 4" from mid-sternum. Transverse measurement $3\frac{1}{2}$ ". The cardiac sounds were irregular. The first, at the apex, was preceded by a rough murmur crescendo in character, filling up nearly the whole of the long pause, running up to, and terminating abruptly at the first sound. At the base the second sound was reduplicated, the pulmonic element being accentuated. The urine was free from pathological elements. Under the influence of quinine salicylas gr. V every four hours the pains quickly subsided, and the temperature fell from 102.8 to 100.8, and although remaining febrile for another week did not exceed this lower register. The quinine was soon reduced to every six hours, and somewhat later to night and morning. The cardiac condition it was decided to treat entirely by rest, and the beneficial

effect of this important therapeutic agent is well illustrated in the tracings. Even as early as four days after admission - tracing No. 4 - every heart beat reached the wrist, and by the eleventh day the heart had become quite regular. The improvement in regularity, however, was not accompanied by any diminution in rate, 160 remaining a fairly constant record, and in order to combat this tachycardia tinct. aconiti M. V. every four hours was given. The drug was commenced on the 27th May - tracing No. 16 - and the success resulting from its administration is strikingly manifest in tracing No. 18. The pulse fell to 90, and the ventricle therefore had a longer time to fill and a larger quantity of blood was propelled with each contraction. All sign of low tension disappeared, and the tracing it will be seen has the characters of a perfectly normal one. Coincident with this slowing of the heart, a systolic murmur at the apex became evident, apparently having escaped detection on admission owing to the rapidity of the

heart's action, and the diagnosis of mitral stenosis had therefore to have regurgitation added to it. While the aconite was continued a still further reduction took place in the pulse rate and when it reached 68 - tracing No. 23 - the drug was stopped, a mixture consisting of tinct. ferri perchlor M7, liq. arsenici hyd. M 4, and liq. strychninae M 4, thrice daily being substituted three days later - tracing No. 26 - and at tracing No. 28 patient was allowed up without ill result.

The two main factors in the treatment of morbus cordis viz. rest and medicinal treatment, are, in this series of tracings, admirably illustrated, but the tracings present another feature which is likewise instructive and interesting. For a period of over three weeks - tracings 18 to 40 - the rate and expression of the pulse remained absolutely normal, but on tracings 41 and 42 it will be noticed that there is some indication of irregularity, an occasional abortive beat occurring in the downstroke. Two days later - tracing 44 - the

pulse became markedly irregular with a tendency to hyper-dicrotism, a number of beats in addition failing to reach the wrist, the tracing in fact resembling that taken on admission. The two following days, curiously enough, the pulse, as indicated by the tracings, was quite normal, but the next day, tracing No. 47, it again became irregular, the tracing presenting the form of irregularity known as the pulsus bigeminus. This relapse at first appeared quite inexplicable as the patient had not been subjecting herself to any undue physical fatigue, but it was ascertained that she had received a letter stating that her mother had had an attack of hemiplegia, and ^{she} worried considerably in consequence. It was considered, therefore, that the cause was mental rather than physical. Here then is an illustration of the fact that the amount of hypertrophy that a heart is capable of undergoing has its limits, and when the maximum is reached any additional strain, mental or physical, gives rise to failure of compensation. Patient left the

hospital in consequence of her domestic trouble, the pulse being quite regular for two days before she left.

The next series of tracings - Figure 9 - was also taken from a case of mitral obstruction and regurgitation, and like the previous one the tracings will appear first, the description following.

Figure 9.



No 1

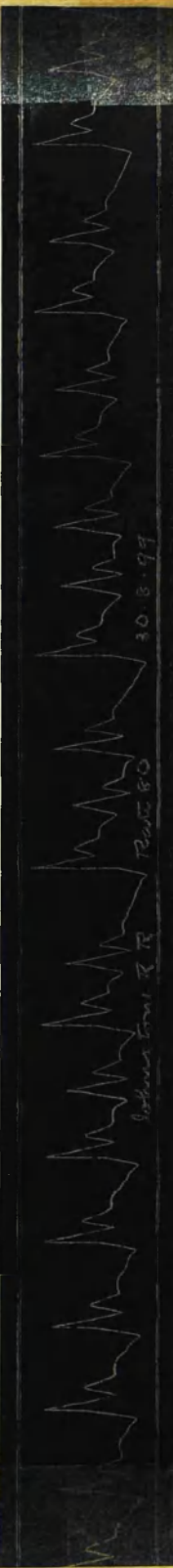
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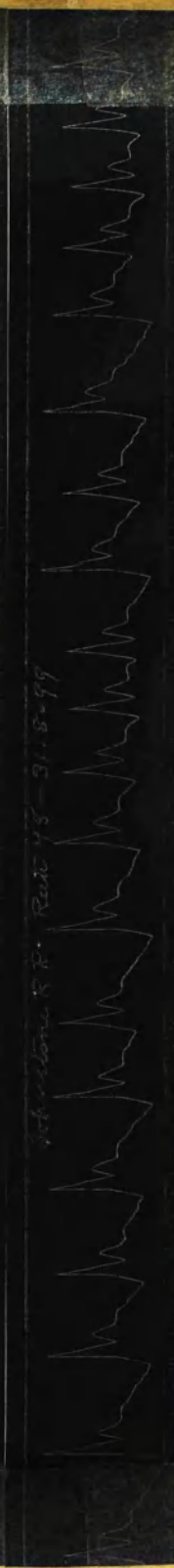
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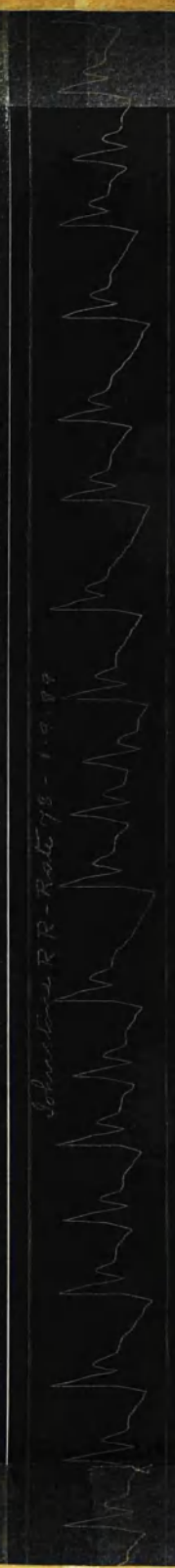
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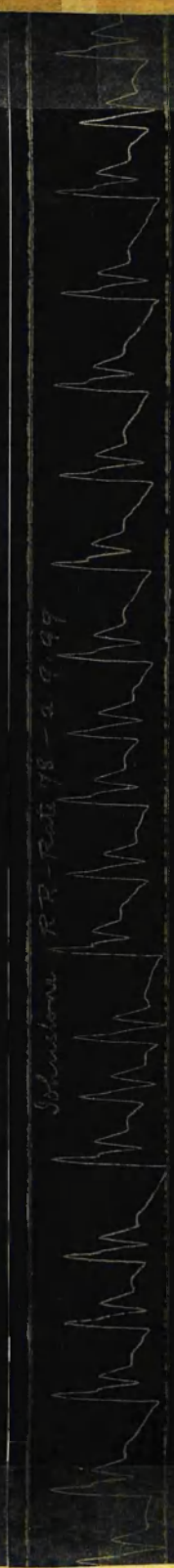
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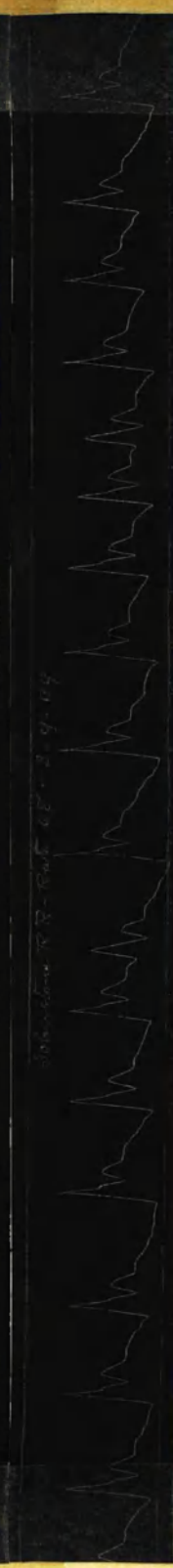
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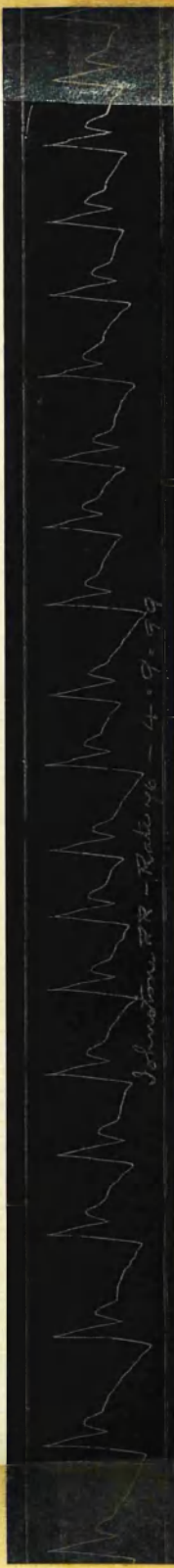
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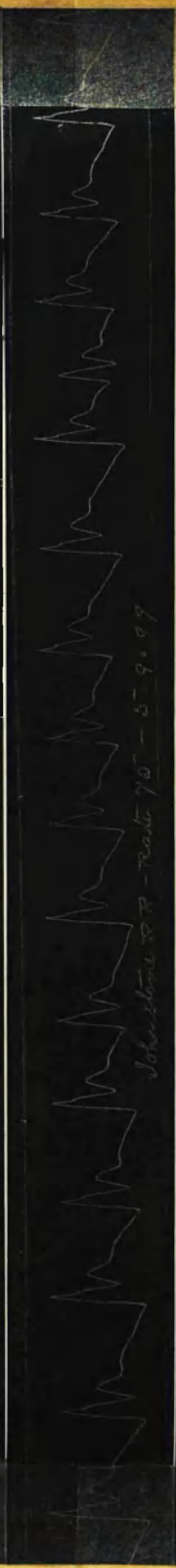
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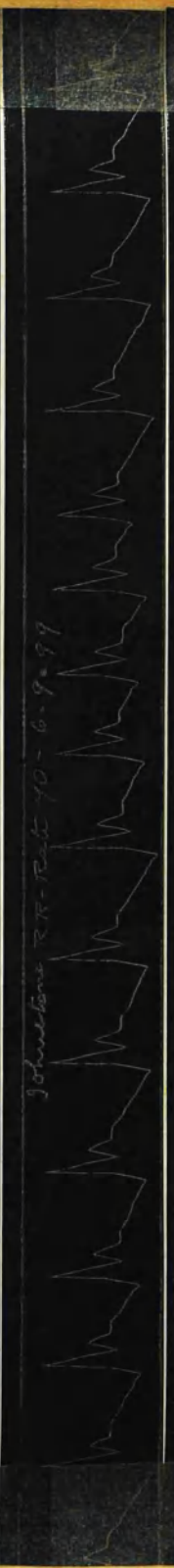
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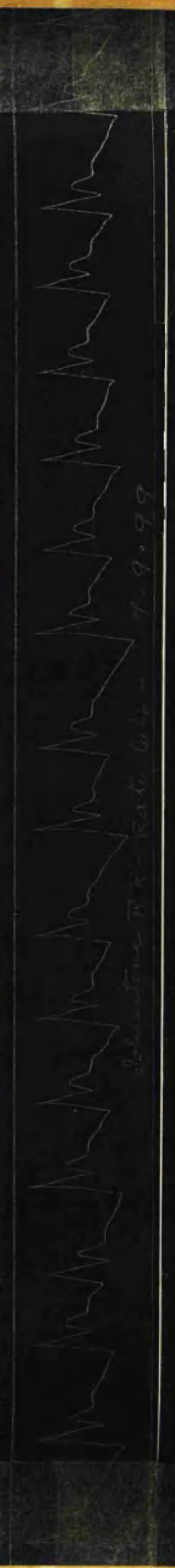
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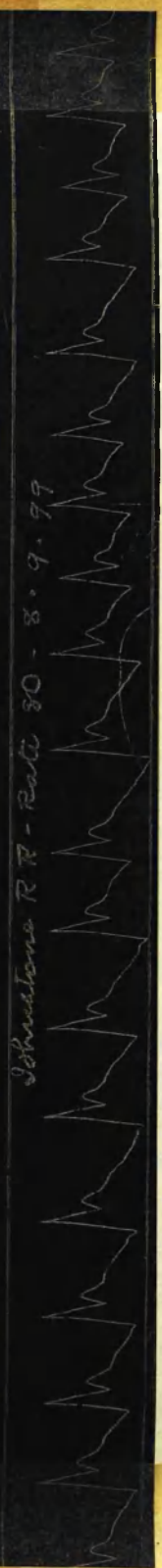
No 13



No 14



No 15



ELIZABETH J., aet 23., Housewife. Admitted into the Western Infirmary suffering from dyspnoea with oedema of the feet and legs. There was a history of acute rheumatism at the age of 17, and during the two years previous to admission she had been in hospital upon four different occasions suffering from breathlessness and swelling of the feet and legs. On admission the breathing was distressed, and there was well marked oedema of the feet and legs. The pulse was very irregular, numbering 100 at the wrist, while at the heart 122 beats were recorded. Respirations 28 per minute. Examination of the heart revealed the apex visible and ^{palpable} tangible in the seventh interspace 6" from mid-sternum, pulsation also being present in the fifth and sixth spaces, and in the epigastrium. The precordial dulness was considerably increased, being bounded above by the third rib, to the right by a line 1" to the right of mid-sternum, and to the left by a line 6" from mid-sternum. Transverse measurement 7". The cardiac sounds presented a loud somewhat musical

systolic murmur over the greater part of the precordium having its greatest intensity at the apical region and audible over the scapulae behind. The second sound was notably accentuated at the pulmonic area. The pleural sacs were free from fluid, and the lungs themselves, with the exception of sibilant rhonchi all over the chest, did not call for remark. The urine was distinctly albuminous, but this disappeared three days after admission. Tracing No. 1 represents the pulse on admission. The irregularity is marked, many of the beats failing to reach the wrist. Under the influence of absolute rest in bed a distinct improvement can be noted in the two following tracings. A mixture consisting of tinct. digitalis M 10, and tinct. nucis vomicae M 7 every four hours was then commenced, a still further improvement resulting. In tracing No. 4 the rate has fallen to 84, every beat reaching the wrist, and with the slowing of the heart the pulse has increased in volume. The continuance of this improvement can be noted on the tracings that

follow, and at No. 15 the patient left the hospital though the pulse was not perfectly regular. It is probable that there would always be a slight irregularity owing to the very marked valvular lesion that existed. The cardiac measurements upon dismissal were very much as on admission, but the apex beat was an inch closer to mid-sternum. During her residence, though a definite presystolic murmur was never present, a re-duplication of the second sound at the apex followed by a diastolic murmur was audible on several occasions, a condition that is interpreted by many as indicating mitral stenosis, and it is more than likely that the mitral regurgitation in this case was associated with obstruction. The next series, Figure 10, was taken from a case of mitral regurgitation.

Figure 10



No 1

No 2

No 3

No 4

No 5

No 6

Kennedy R R - Rate 90 - 13. 5. 99

Kennedy R R - Rate 88 - 26. 5. 99

Kennedy R R - Rate 84 - 20. 5. 99

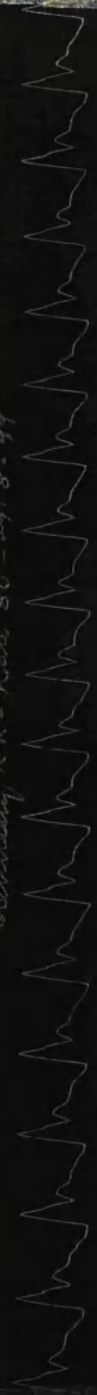
Kennedy R R - Rate 75 - 16. 5. 99

Kennedy R R - Rate 80 - 27. 5. 99

Kennedy R R - Rate 80 - 28. 5. 99

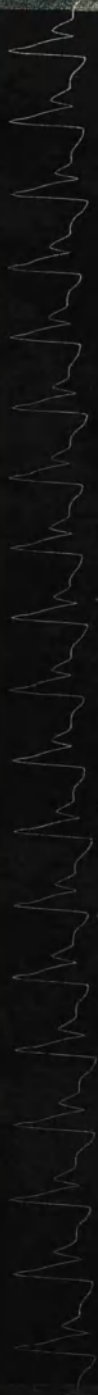
No 7

Kennedy RR - Rate 50 - 29. 8. 79



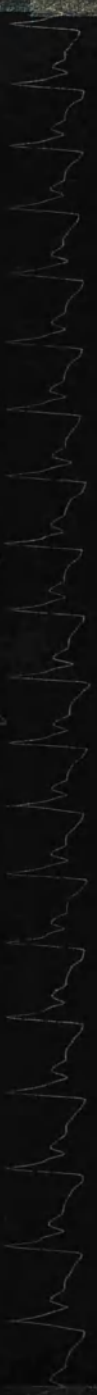
No 8

Kennedy RR - Rate 54 - 30. 8. 79



No 9

Kennedy RR - Rate 78 - 31. 8. 79



No 10

Kennedy RR - Rate 78 - 31. 8. 79



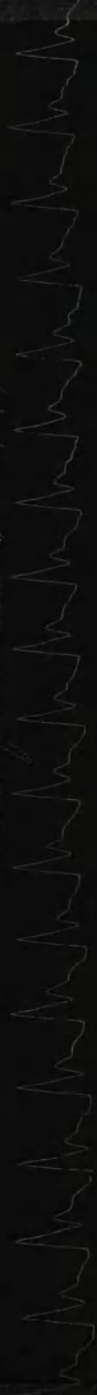
No 11

Kennedy RR - Rate 50 - 2. 9. 79



No 12

Kennedy RR - Rate 54 - 2. 9. 79



ANGUS K., aet. 38, Dairyman. Admitted into the Western Infirmary complaining of breathlessness on exertion, cough with expectoration, and swelling of the legs and abdomen. There was a history of acute rheumatism twenty-five years before admission after which he enjoyed good health up to two years ago. He then became the subject of cough and expectoration, with failing strength, the sputum being occasionally streaked with blood. Dyspnoea upon exertion attracted his attention a couple of months later, these symptoms being then aggravated by an attack of influenza.

Upon recovering from the influenza he returned to his work which at this time was that of coachman, but after remaining at it for a year, during which the breathlessness increased, he was compelled to change his occupation. He, therefore, started a small milk shop, but in the course of a few months his legs began to swell. With the aid of occasional days in bed he was able to carry on his business for six months, but in consequence of the increase of cough and

dyspnoea, and the addition of abdominal distension, he was compelled to seek admission into the Hospital. Upon admission he was unable to adopt the recumbent posture on account of respiratory distress. The pulse was slightly irregular, of low tension, 108 in rate, the accessible arteries presenting evidence of degeneration. Respirations 28. There was marked distension with pulsation of the right jugular vein, the left being involved to a less extent. Pitting on pressure was easily elicited over the feet and legs, and there was distinct evidence of free fluid in the abdominal cavity. Upon examination of the heart the apex beat was visible and tangible on the fifth interspace $4\frac{3}{4}$ " from mid-sternum. The precordial dullness was bounded above by the third rib, to the right by mid-sternum, and to the left by a line $5\frac{1}{4}$ " from mid-sternum. Transverse measurement $5\frac{1}{4}$ ". A systolic murmur was audible all over the precordium, having its greatest intensity a little to the left of the xiphoid, while the second pulmonic sound was accentuated, and, in fact,

could only be heard at the pulmonic cartilage. There was evidence of fluid at the extreme right base, while at both bases moist rales were audible, otherwise the lungs were unaltered. The liver measured $2\frac{1}{2}$ " in midline and 5" in the nipple line, but was free from tenderness. The urine contained albumen to the extent of .04%, but this disappeared entirely two days after admission. Under the influence of rest in bed and Guy's pill thrice daily speedy improvement took place. Two days after admission he was able to assume the recumbent posture, and was free from respiratory distress. The urinary output reached considerably over 100 ounces, and the oedema and ascites gradually subsided. Twelve days after admission a mixture of tinct. ferri perchlor M X, tinct. strophanthi M V, liq. arsenici hyd. M 3, and liq. strychninae M 3 was substituted for Guy's pill, and the following day patient was allowed up.

His cardiac condition at this time remained much as on admission except that the systolic murmur was less loud over the right ventricle. This

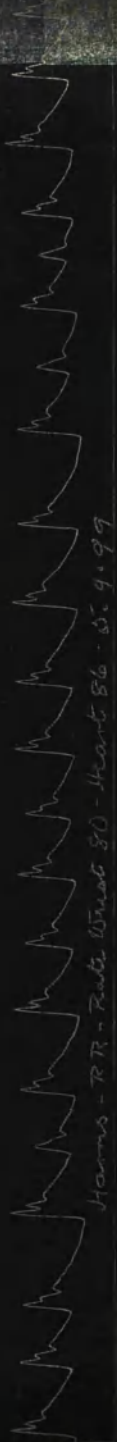
was a clear case of mitral regurgitation with failure of compensation, the valvular lesion being acquired no doubt during the attack of acute rheumatism twenty-five years before. Tracing No. 1 represents the pulse on admission, the chief characters of which are irregularity and low tension. The former soon disappeared, the pulse being quite regular from tracing 4 onwards. The tension, however, remained somewhat low.

The next series, Figure 11, was also taken from a case of cardiac disease, but from a case of a very different nature, the lesion being myocardial, instead of valvular.

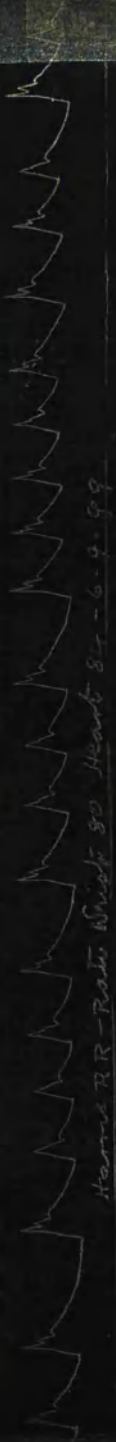
Figure 11.



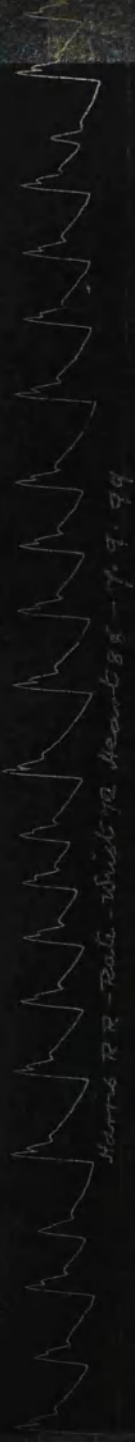
No 7



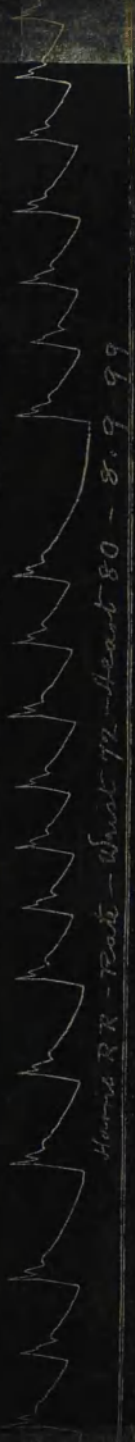
No 8



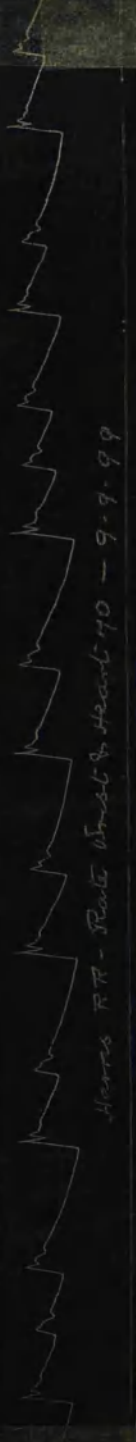
No 9



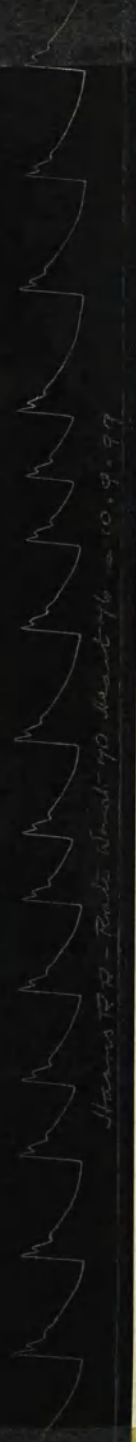
No 10



No 11



No 12



WILLIAM H., aet. 59, Labourer. Admitted into the Western Infirmary suffering from dyspnoea, with oedema of the feet and legs. He had always been the subject of good health up to eight months before admission, when he noticed that his feet began to swell, more especially after a day's work. Dyspnoea soon followed, and in consequence of the aggravation of these symptoms he was compelled, six months later, to go into hospital. He was dismissed much improved after three weeks' residence, and two weeks later resumed his work, but in the course of ten days his symptoms returned, and he was compelled to seek admission into the Western Infirmary. Upon admission there was considerable orthopnoea and well marked oedema of the feet and legs. The pulse was small, markedly irregular, and of low tension, numbering 120 at the wrist, while at the heart 140 beats were recorded. The accessible arteries presented evidence of degeneration. The respirations, 24 in rate, approached the Cheyne Stokes character, without any distinct period of apnoea. The apex beat was visible and

tangible in the fifth interspace 4" from mid-sternum, and the precordial dulness was bounded above by the third rib, to the right by the left sternal margin, and to the left by a line $4\frac{1}{2}$ " from mid-sternum. Transverse measurement 4". The cardiac sounds were free from murmur, but were very irregular, and presented the superficial, flapping, leathery character indicative of myocardial degeneration. A small amount of fluid was present in the right pleural sac, and the liver gave evidence of hepatic congestion. The urine was free from albumen. Upon admission patient was given a mixture containing tinct. digitalis M X and caffein citratis gr. V every four hours, with the result that the urinary output next day reached 154 ounces. The oedema speedily subsided, and the breathlessness disappeared.

Tracing No. 1 represents the pulse on admission, and its irregular character is very marked, a number of beats failing to reach the wrist, the cardiac pulsations numbering 140, and the radial pulse 120. A gradual diminution in rate occurred,

the cardiac pulsations even at tracing No. 3 having fallen to 112, and later, reached 70. The pulse never became perfectly regular and probably never will owing to the degenerate cardiac muscle, but the improvement shown by tracing 13, as compared with tracing No. 1 is very notable.

The next series was also taken from a case of cardiac degeneration.

Figure 12.

№ 1

№ 1 Key RR - Rate 85 - 2.7.99

№ 2

№ 2 Key RR - Rate 98 - 2.7.99

№ 3

№ 3 Key RR - Rate 88 - 2.7.99

№ 4

№ 4 Key RR - Rate 92 - 3.7.99

№ 5

№ 5 Key RR - Rate 80 - 4.7.99

№ 6

№ 6 Key RR - Rate 84 - 2.7.99

51

No 4

W. Kay R.R. - Rate 88 - 6.7.99



No 8

W. Kay R.R. - Rate 82 - 7.7.99



No 9

W. Kay R.R. - Rate 84 - 8.7.99



No 10

W. Kay R.R. - Rate 75 - 9.7.99



No 11

W. Kay R.R. - Rate 80 - 10.7.99



No 12

W. Kay R.R. - Rate 76 - 11.7.99



RICHARD McK., aet. 43, Labourer. Admitted into the Western Infirmary complaining of dyspnoea, cough, and haemoptysis. Three months before admission he became conscious that he was unable to exert himself without becoming unduly breathless, and on this account, a month later, was compelled to give up work. Two weeks before admission symptoms of haemorrhagic infarction of the lung, viz. lancinating pain, cough, and haemoptysis, became manifest, his dyspnoea at the same time increasing so that he became breathless even while at rest. Prior to the onset of this illness he enjoyed good health, and with the exception of an attack of pleurisy dating two years back he had never been ill before.

On admission there was slight evidence of cyanosis, and though there was dyspnoea he was able to assume the recumbent posture. The respirations numbered 36, and presented the Cheyne Stokes characters. The pulse was of low tension, 83 in rate, the rhythm corresponding to that of the respirations, being small and rapid during the period

of dyspnoea, while during the period of apnoea the rate became slow and the pulse more ample.

Tracings Nos. 1 and 2 were taken at this time, the former showing the variation in the rate, and volume of the pulse during the period of apnoea.

The accessible arteries gave distinct evidence of degeneration. The pupils were normal, but did not become smaller during the period of apnoea. There was only slight indication of oedema, but the urine presented distinct evidence of albumen, both however disappeared shortly after admission. The temperature was slightly febrile. Upon examination of the heart the apex beat was visible and tangible on the sixth interspace $5\frac{1}{4}$ " from mid-sternum, the precordial dulness being bounded above by the third rib, to the right by mid-sternum, and to the left by a line $5\frac{1}{2}$ " from mid-sternum. Transverse measurement $5\frac{1}{2}$ ". Auscultation over the precordium revealed evidence of considerable pulmonary rale. The first sound at the apex was followed by a

soft systolic murmur, while over the greater part of the right ventricle a louder murmur was detected, having its greatest intensity to the left of the junction of the xiphoid and gladiolus. At the base there was a slight systolic murmur confined to the aortic area. Examination of the lungs revealed evidence of considerable râle both back and front, those on the upper part of the chest being dry in character, while over both bases moist râles predominated. There was no indication of localized dulness or tubularity of the breath sounds. The liver was tender to palpation, and uniformly enlarged, measuring $5\frac{1}{2}$ " in mid line and 6" in nipple line. The sputa were fairly abundant consisting of tenacious mucus uniformly blood-stained.

The treatment consisted of entire rest in bed, and the administration of tinct. digitalis M X every three hours. The tracings were taken daily, Nos. 1 and 2 representing the pulse before medicinal treatment was instituted, No. 3 after two doses of the drug. The subsequent tracings

show a rapid improvement, but in addition to the pulse, improvement took place in other respects, the dyspnoea soon disappearing and the haemoptysis becoming less. In a week the physical signs of cardiac dilatation were much less evident, and a little later the apex appeared in the fifth interspace, by which time the precordial dulness was almost within normal limits and the murmurs had disappeared. At tracing No. 13 - which may be called normal though perhaps a little dicrotic - the digitalis was stopped, and a tonic of iron, arsenic and nux vomica substituted. Convalescence was interrupted by symptoms and distinct physical signs of further embolic mischief in the lungs, but as it presented no sphygmographic signs, and soon improved, the fact is merely mentioned.

The next series, Figure 13, represents still another case of myocardial degeneration.

Figure 13.



No 1

No 2

No 3

No 4

No 5



No 206

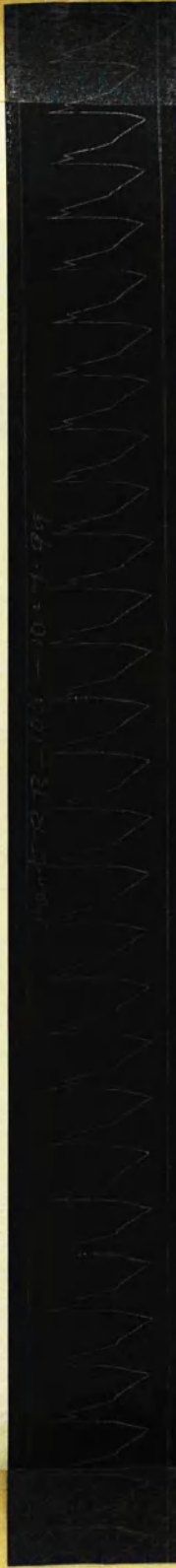
No 207

No 208

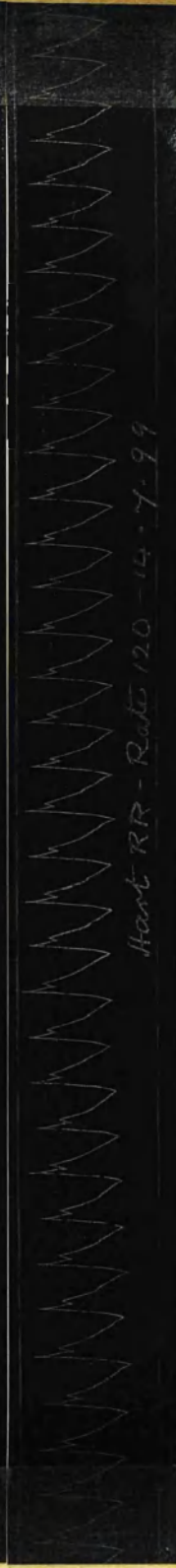
No 209

No 210

No 11

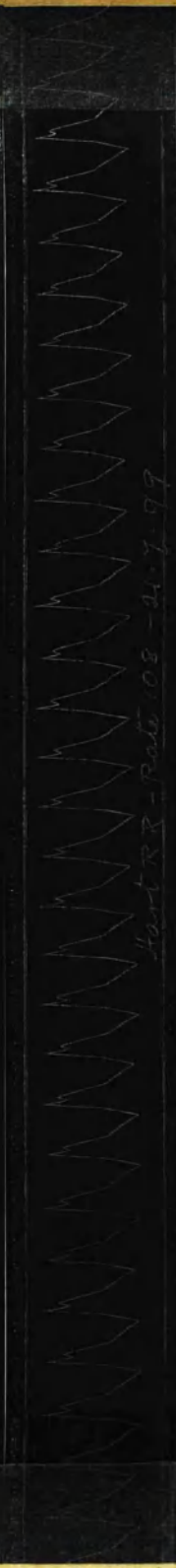


No 12



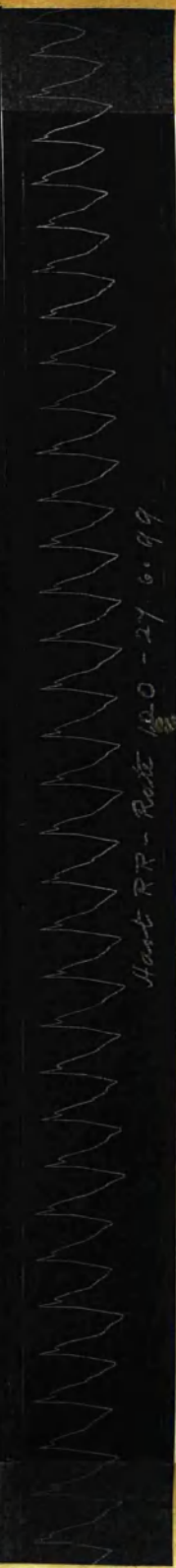
Hant RR - Rate 120 - 14.7.99

No 13



Hant RR - Rate 108 - 21.7.99

No 14



Hant RR - Rate 120 - 27.6.99

MARGARET H., aet. 53, Housewife. Admitted into the Western Infirmary July 27th 1899 suffering from orthopnoea. The onset of her illness she dated seven months back, at which time she became the subject of an attack of bronchitis associated with breathlessness on exertion. This, she recovered from in the course of three months, but the dyspnoea frequently returned, and six weeks before admission took on the characters of orthopnoea. She had always been a healthy woman previous to the onset of her present symptoms. Patient carried a considerable quantity of adipose tissue weighing 12 stone 13 lbs. without her clothes, and on admission was unable to assume the recumbent posture on account of her breathlessness, the lips being slightly cyanosed. The pulse was somewhat irregular, though of fair tension, and 116 in rate, the accessible arteries presenting signs of degeneration. Respirations 32. Upon examination of the heart the apex beat was neither visible nor tangible, and the precordial dulness extended to the right as far as the

right sternal margin, measuring transversely $4\frac{1}{2}$ ". The cardiac sounds were free from murmur, but the first sound at the apex and over the right ventricle was reduplicated. There was no evidence of oedema or effusion into the pleural sacs, and the lungs with the exception of some oedema at the base of the left were unaltered. Albuminuria to the extent of .06% was present and microscopic examination of the urine revealed the existence of a few hyaline casts, both however disappearing in a few days. The treatment consisted of absolute rest in bed with the administration of a mixture consisting of tinct. digitalis M 7, caffein cit. gr. V, and pot. iodid gr. III, every three hours. Tracing No 1 represents the pulse shortly after admission, before medicinal treatment was instituted, tracing No. 2 after three doses of the mixture, and it may be seen that there is a distinct improvement. Tracing No. 3 was taken the following day, and still shows slight irregularity, but at No. 4 all indication of irregularity had disappeared and patient was for

the first time since admission able that evening to assume the horizontal position without discomfort. During the next three days occasional vomiting occurred after the administration of the medicine, and it had therefore to be stopped, a mixture consisting of liq. strychninae M IV, and liq. arsenici hyd. M IV, being substituted thrice daily. In addition to this however digitalis was given in the form of M XV of the tincture every night, without producing gastric disturbance. Tracing No. 7 was taken the day after the new treatment was instituted. The patient kept perfectly well, the dyspnoea remained absent, and the regularity of the pulse persisted. Still, the pulse tended to be rapid, and to overcome this, aconite was resorted to, M V of the tincture being given every two hours, the previous medicines being stopped. Tracings 7 and 10 represent the period during which the arsenic, strychnine and digitalis were being given, the aconite being started immediately after tracing No. 10 was taken. The effect of the aconite may be seen in tracing No. 11 where

the pulse rate is recorded at 120, the intervening days on which tracings were not taken, showing a similar increase in rapidity. This series contrasts very well, as far as the effect of aconite is concerned with Figure 8, where the diminution of the pulse rate was almost instantaneous, and it illustrates the fact that aconite, while it usually diminishes the rapidity of the pulse, in some cases increases it.

The aconite was stopped after tracing No. 11 was taken, and a slight reduction on the rate resulted, the two following tracings being taken at intervals of a week.

The next series, Figure 14, was taken from a case of pericarditis and pleurisy occurring in the course of acute rheumatism.

Figure 14.



No 1

No 2

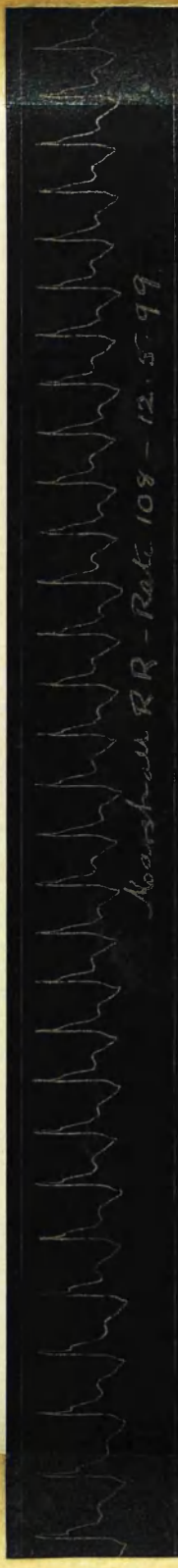
No 3

No 4

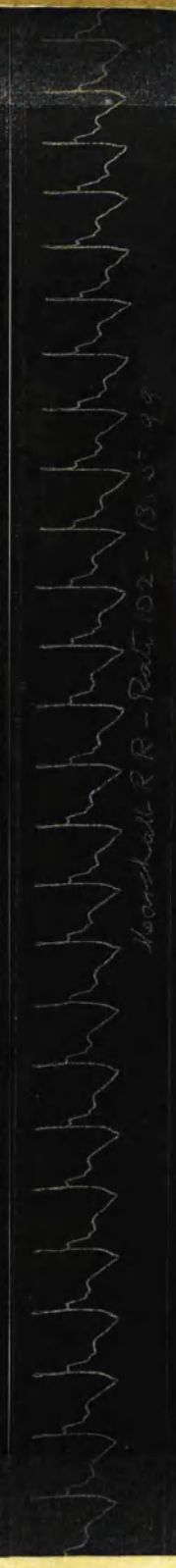
No 5

No 6

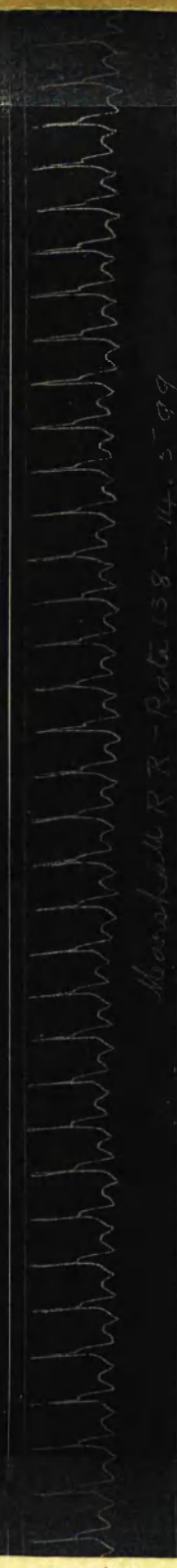
No 7



No 8



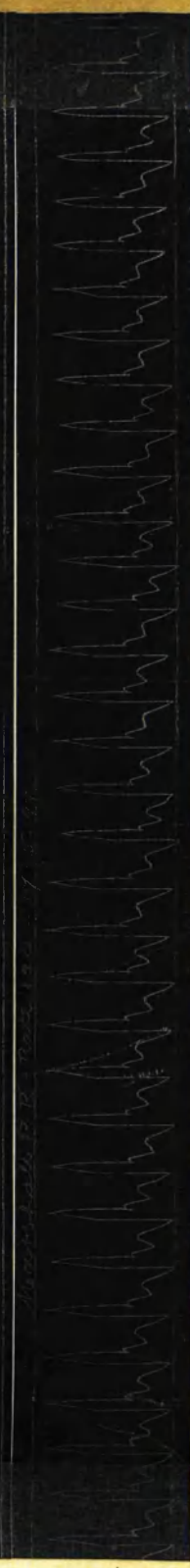
No 9



No 10



No 11





Marshall RR - Rate 108 - 18.5.99

Marshall RR - Rate 100 - 19.5.99

Marshall RR - Rate 99 - 20.5.99

Marshall RR - Rate 100 - 21.5.99

No 12

No 13

No 14

No 15

ELIZABETH M., aet. 17. Admitted into the Western Infirmary suffering from acute rheumatism, pericarditis and pleurisy with effusion. She had two attacks of rheumatic fever during the last ten years, both being severe. The onset of her present illness occurred a fortnight before admission, and was marked by polyarthrititis, sweating, and pyrexia. These symptoms were soon followed by pain over the precordium, breathlessness, and cough with slight expectoration. Upon admission the respirations were rapid, numbering 48, the pulse being regular, soft, 105 in rate, and somewhat shotty in character. The knee and ankle joints presented evidence of slight effusion. The temperature registered 102.4, and continued febrile for a fortnight after admission. Upon examination of the heart the apex was visible and tangible in the fourth interspace, half an inch to the inner side of the nipple line. The precordial dulness formed a cone shaped area, the apex of which reached as high up as the right sterno-clavicular articulation. The right border transgressed the mid-sternal line by 2", and the

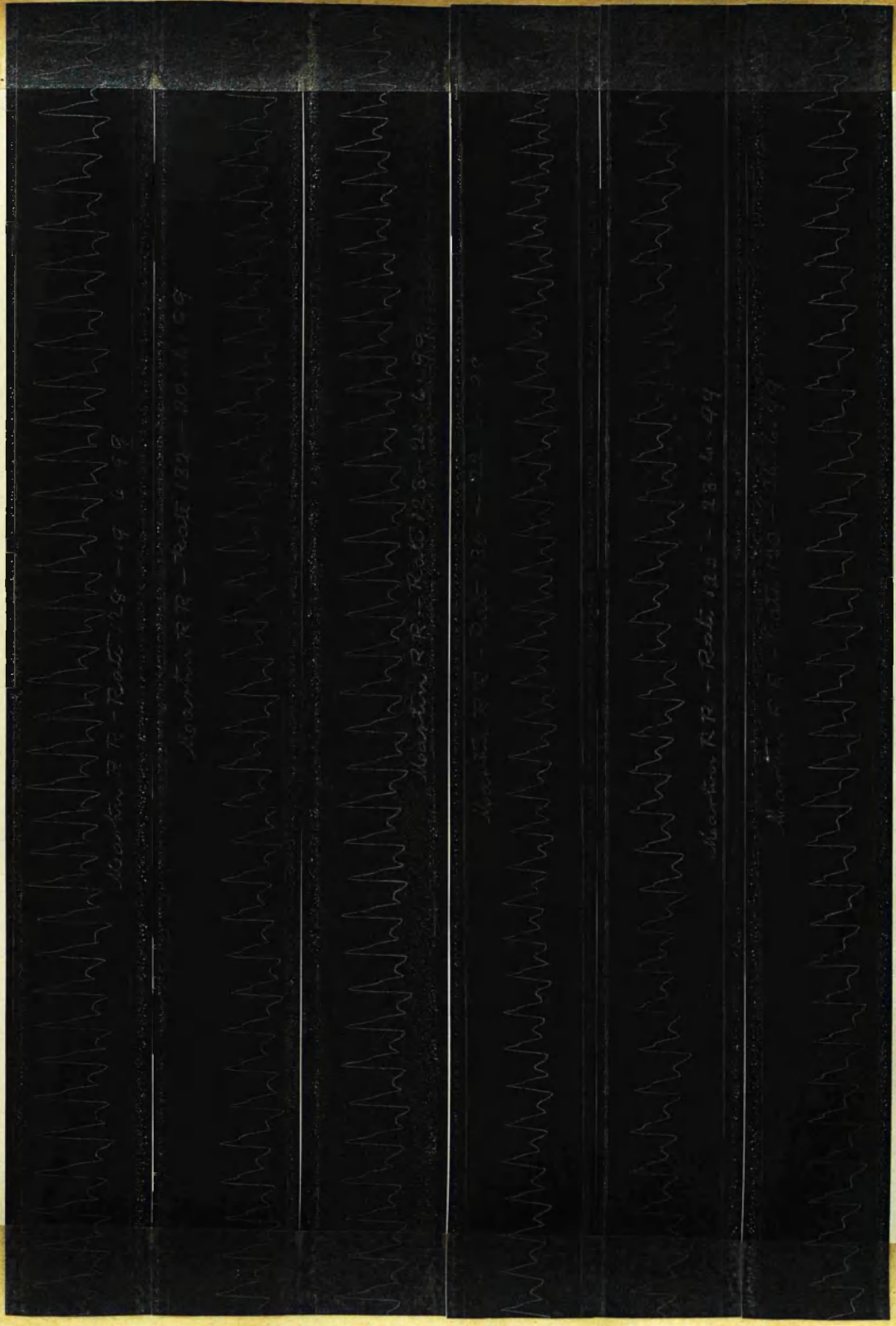
left extended $\frac{3}{4}$ " outside the left nipple line. Transverse measurement $7\frac{3}{4}$ ". Pericardial friction was widespread over the precordium, but most intense at mid-sternum. The left pleural sac presented evidence of effusion, which extended as high up as the angle of the scapula where pleural friction was plainly audible. The urine contained no albumen. Under the exhibition of quininae salicylas gr. V every four hours the joint pains subsided, and the temperature, the evening rises of which had varied between 102 and 103, fell to 100 two days after admission. In the course of a fortnight the temperature became normal, and the quinine was reduced to thrice daily. For a few days after admission the precordial dulness increased rather than diminished, the transverse measurement becoming $8\frac{1}{2}$ ", and somewhat later, with the absorption of the fluid, a systolic murmur endocardial in origin became apparent at the apex. Local applications of linseed and mustard were resorted to and absorption, both of the pleural and pericardial effusions became almost complete. The

pericardial friction diminished and though unequivocal over the base of the heart became much softer in quality over the sternum giving rise to the suggestion of bruits aortic in origin. At this stage the patient left the hospital, but the tracings which were taken daily illustrate the improvement that took place during her residence.

Tracing No. 1 represents a large soft rapid pulse, and these characters are maintained throughout the greater part of the series, the last two tracings only, approaching a normal type.

The next series was also taken from a case of pericarditis with effusion occurring in the course of acute rheumatism.

Figure 15.



No 1

No 2

No 3

No 4

No 5

No 6

No 7

Heart R - Rate 116 - 95 - 6 - 99



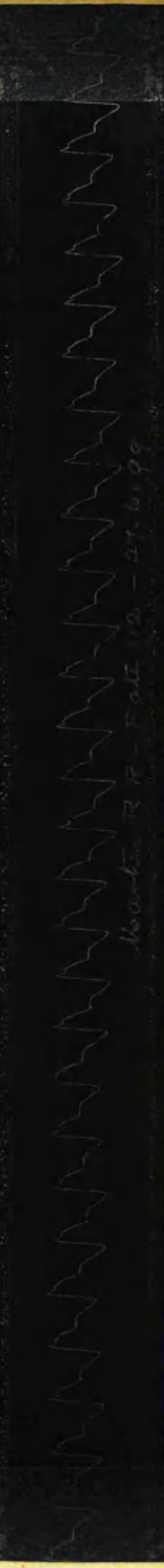
No 8

Heart R - Rate 100 - 26 - 6 - 99



No 9

Heart R - Rate 100 - 27 - 6 - 99



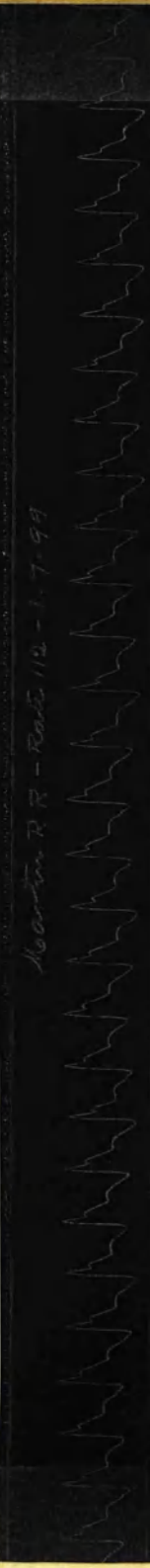
No 10

Heart R - Rate 103 - 89 - 6 - 99



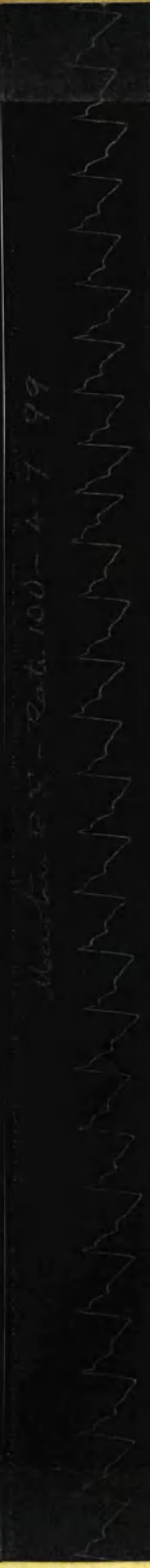
No 11

Heart R - Rate 112 - 1 - 7 - 99



No 12

Heart R - Rate 100 - 4 - 7 - 99



MAGGIE M., aet. 22, Electro-plate Burnisher. Admitted into the Western Infirmary with well-marked symptoms of acute rheumatism. Under the exhibition of sodii salicylas gr. 20 every two hours and potass bicarb. gr. 60 once daily, these subsided, and the salicylate was gradually reduced, and finally stopped. In a few days, however, the joint pains returned and the temperature again became febrile, the salicylate again being resorted to. The illness was a very protracted one, and was associated at different times with several complications - viz. pleurisy with effusion, consolidation of the base of one lung, and pericarditis with effusion, and it was during the course of the pericarditis that the accompanying series was taken. The temperature which had been approaching normal limits, again became febrile, rising as high as 103° . The joint pains returned, and pericardial friction followed by effusion, and accompanied by precordial pain and dyspnoea appeared. The effusion was not excessive, the dome shaped area of precordial dulness being bounded above by

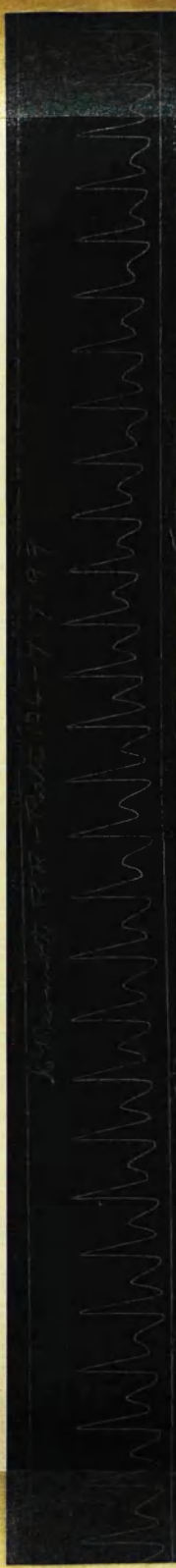
the lower border of the first rib, to the right by a line $1\frac{1}{4}$ " to the right of mid-sternum, and to the left by a line $4\frac{1}{2}$ " to the left of mid-sternum. Transverse measurement $5\frac{3}{4}$ ". Local applications of linseed and mustard were applied and quinine salicylas gr. 5 administered every four hours, the effusion absorbing in a fortnight. The cardiac sounds were now found to be accompanied by a well marked systolic murmur at the apex, transmitted towards the axilla and audible over the scapulae. This had all the characters of an organic murmur and as it had not been present previous to the attack of pericarditis, it was evident that the pericarditis had been associated with endocardial inflammation. Upon inspection of the series of tracings it is quite striking how little the pulse is affected by such a serious illness. The characters of tracing No. 1, apart from the rapidity of the pulse, are merely those of low tension, and the gradual improvement presented by the series consists of a diminution in rate and an increase in the tension. With the exception of

the rate which is a little rapid, the last four tracings represent a normal pulse notwithstanding the fact that mitral regurgitation existed: a further illustration of the difficulty in the diagnosis of some cardiac lesions by inspection of the sphygmographic tracing.

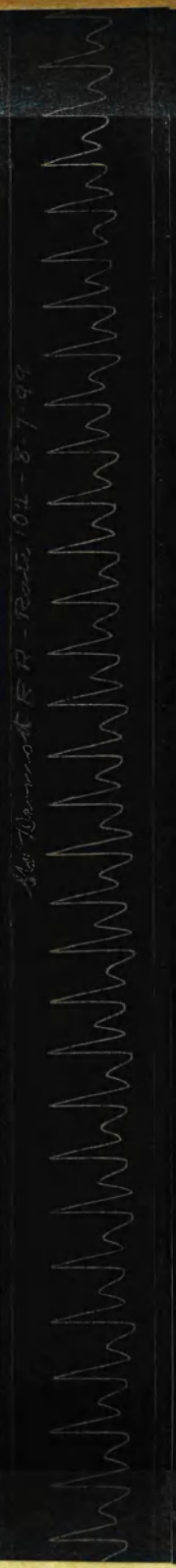
The next series, Figure 16, was taken during the course of pneumonia.

Figure 16.

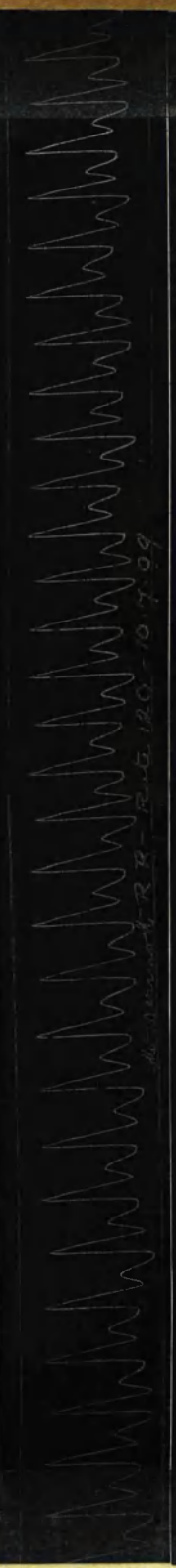
No 1



No 2



No 3



No 4



No 5



No 6



Ms. Harvard F.R. - Ross 102-8-7-99

Ms. Harvard F.R. - Ross 120-10-7-99



No 7

No 8

No 9

No 10

No 11

No 12

McDonough RR - Rate 54 - 19 7 99

McDonough RR - Rate 58 - 20 7 99

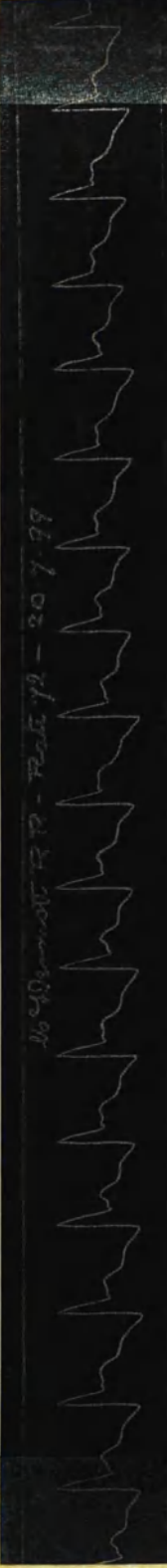
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McDonough RR - Rate 58 - 17 7 99

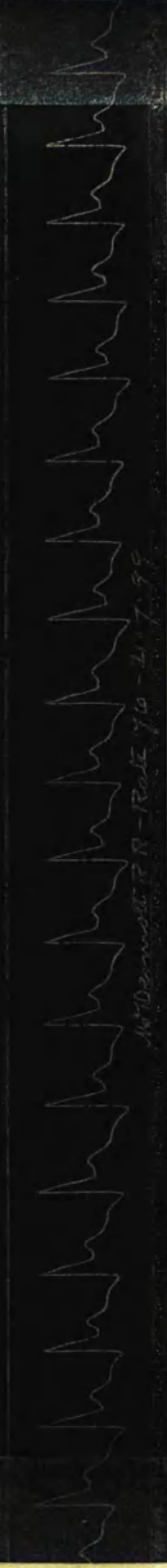
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McDonough RR - Rate 78 - 19 7 99

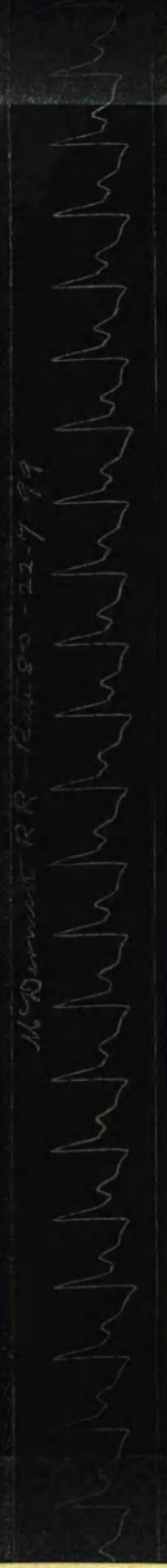
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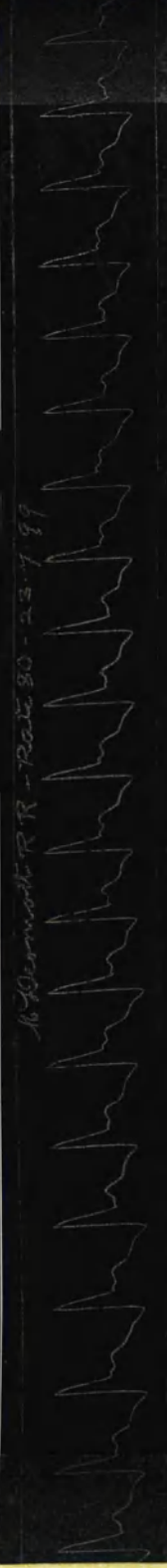
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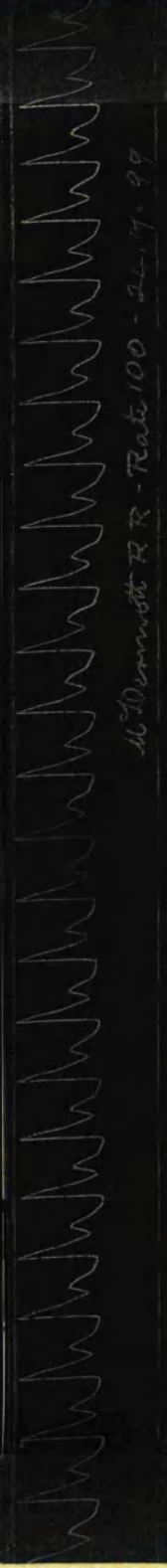
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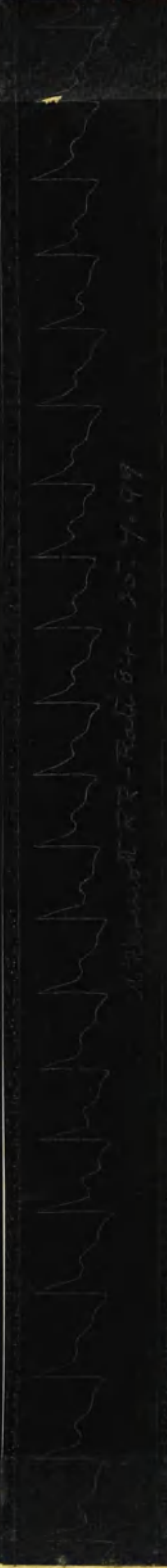
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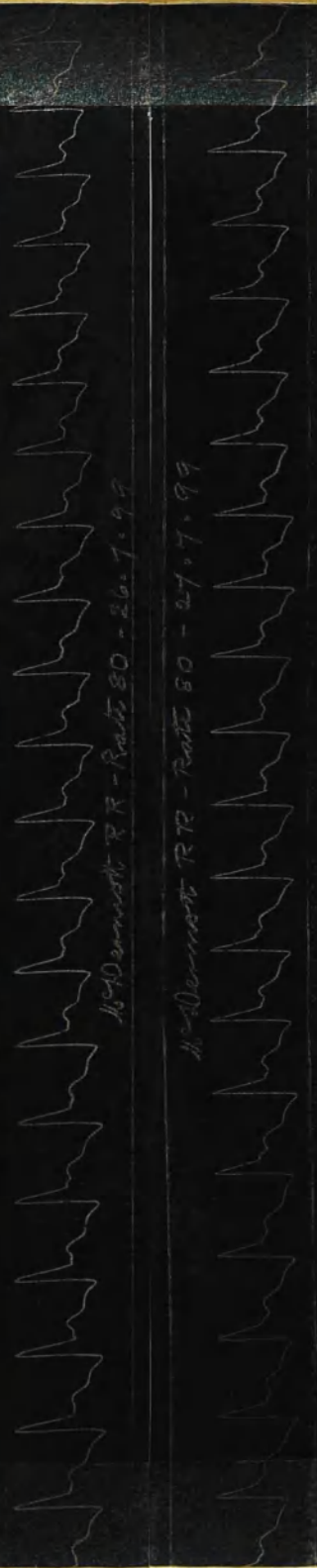
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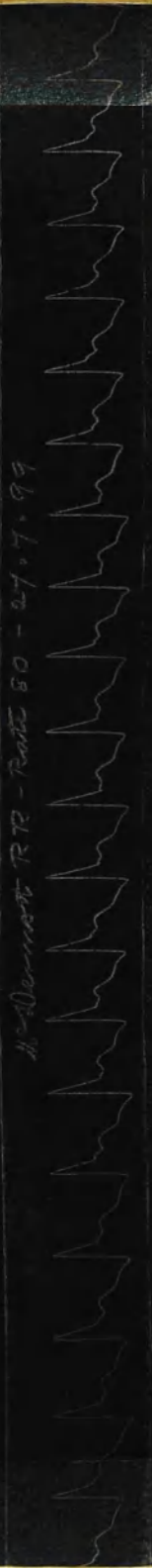
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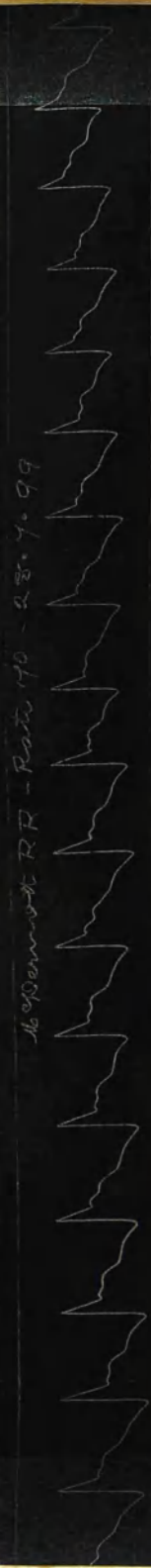
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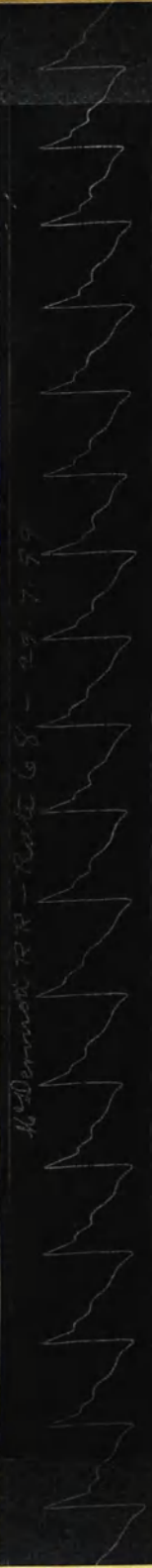
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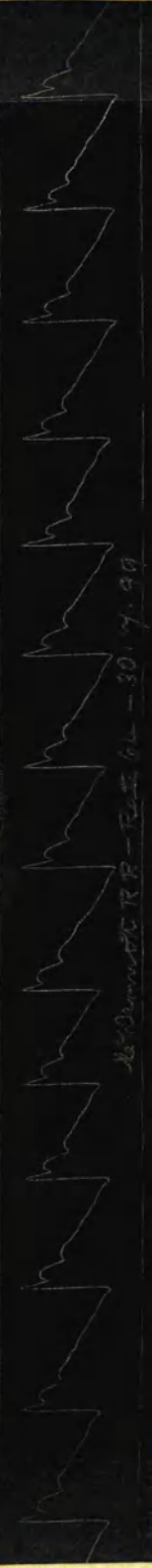
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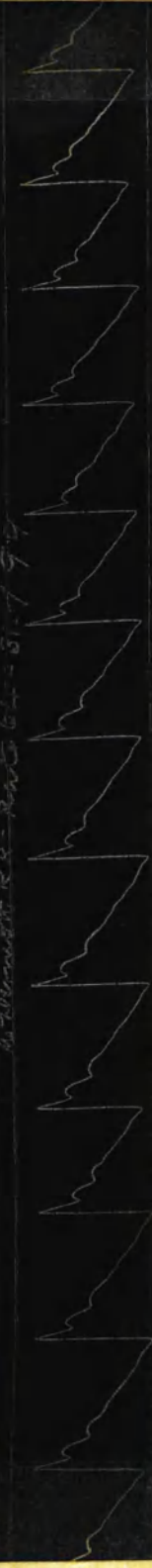
No 22



No 23



No 24



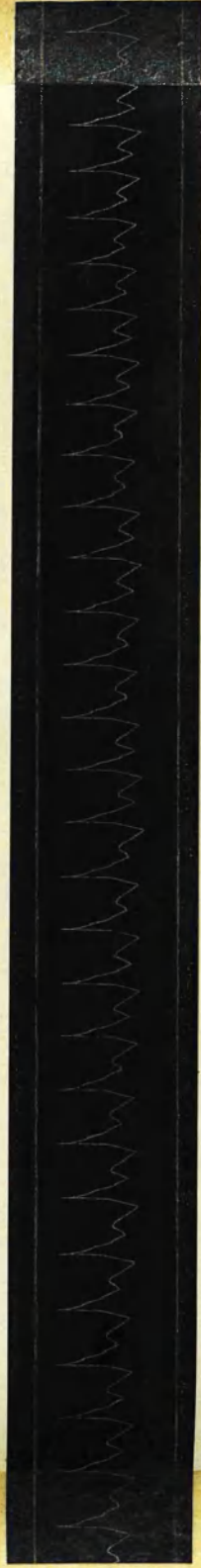
JOHN McD., aet. 36, Labourer. Admitted into the Western Infirmary suffering from symptoms of pneumonia. Three days before admission he became the subject of lancinating pain in the right side of the chest, increased by movement and deep inspiration - a day later this became associated with cough and expectoration, the latter being described as "tough and brownish in colour." He attributed his illness to a wetting he received while intoxicated three days before the onset of his present symptoms. Upon admission the pulse was regular, dicrotic, 100 in rate, the respirations numbering 28. Examination of the lungs revealed well marked signs of solidification of the right base. Over this region there was dulness to percussion, vocal fremitus and vocal resonance were increased, and whispering pectriiloquy present, the breath sounds being distantly tubular. In the course of a few days the affected lung became involved in its whole extent. The sputa were scanty, tenacious, minutely aerated and typically rusty in colour. The urine presented a trace

of albumen with marked diminution of the chlorides. The temperature ran a characteristic course reaching as high as 104° , but the crisis occurred at tracing No. 7, which was taken a few hours after the temperature reached normal. The first three tracings are fully dicrotic and occasionally slightly hyperdicrotic, but, except for the increase in rate, otherwise do not call for remark. A cardiac tonic of tinct. digitalis M 7, and liq. strychninae M 4, was commenced every four hours between tracings Nos. 3 and 4, and a slight improvement in the tension resulted, but it was not until the crisis occurred, between tracings Nos. 6 and 7 that the improvement was at all marked. Even then the tension persistently remained low until patient was allowed up - tracing No. 19 - after which it rapidly became normal. Rather an interesting point is connected with tracing No. 17. The temperature which had been normal for ten days was marked at this period by an evanescent rise to 100.6 and the effect on the pulse may be seen in the tracing. The rate has increased to 100 and the tension

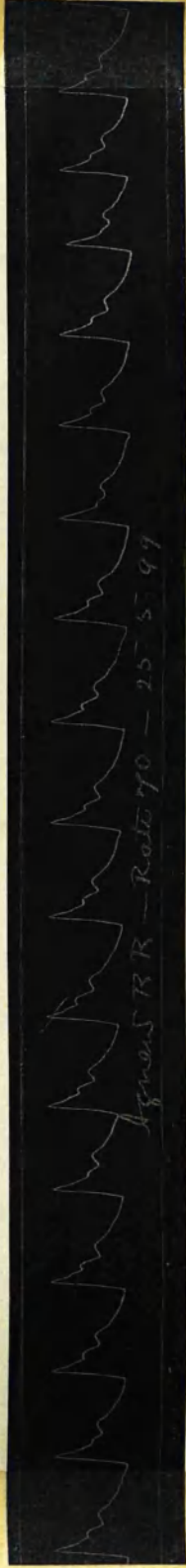
become again almost fully dicrotic. The following day tracing No. 18, the temperature was once more normal, and a corresponding improvement represented in the pulse.

The next series was taken from an interesting case of leukaemia.

Figure 17.



Hemoglobin 25%. Red Corpuscles 1,784,500. Ratio 156.



Hemoglobin 25%. Red Corpuscles 1,425,000. Ratio 156 163.



Hemoglobin 50%. Red Corpuscles 5,024,000. Ratio 156 146.

ANDREW A., aet. 27., Marine Fireman. Admitted into the Western Infirmary with well marked evidences of Leukaemia. Six years previous he had an attack of malaria, and five months before admission he had another and more severe attack, from which he dated the onset of his present illness. There was no specific history. His main symptoms were headache, dyspnoea, and failing strength, so that he was unable for some time before admission to walk even short distances without fatigue. There had been no haemorrhages of any kind. Upon admission he presented signs of severe anaemia, the face was pallid and the mucous membranes markedly deficient in colour. There was visible pulsation in the vessels of the neck, and a loud bruit was heard over the jugular veins. A systolic murmur was audible all over the cardiac area with its greatest intensity over the base. The spleen was slightly enlarged, measuring 5" vertically. Microscopic examination of the blood revealed a great excess in the number of white corpuscles, there being one white to six red. The haemoglobin was only 25%,

and the red blood corpuscles only 1,787,500 per cubic millimetre. The rouleaux were almost absent, but there was no indication of poikilocytosis. No haemorrhages were detected by the ophthalmoscope, and apart from the very striking pallor, there was no pathological alteration on the fundus oculi. The treatment in this case consisted of liquor arsenicalis pushed to the verge of intolerance. The dose was commenced at M IV thrice daily, and increased by M I every day until M X were being taken. The increase was then made every second day until M XIII were being taken thrice daily. At this stage physiological symptoms of the drug became manifest, and the dose was diminished to M ~~XI~~ II, and a few days later to M VIII. A marked improvement took place under this treatment.

Tracing No. 1 represents the pulse on admission, the haemoglobin being 25%, the red blood corpuscles 1,787,500 per cubic millimetre, and the white blood corpuscles in the proportion of 1 white to 6 red. The main feature of the trac-

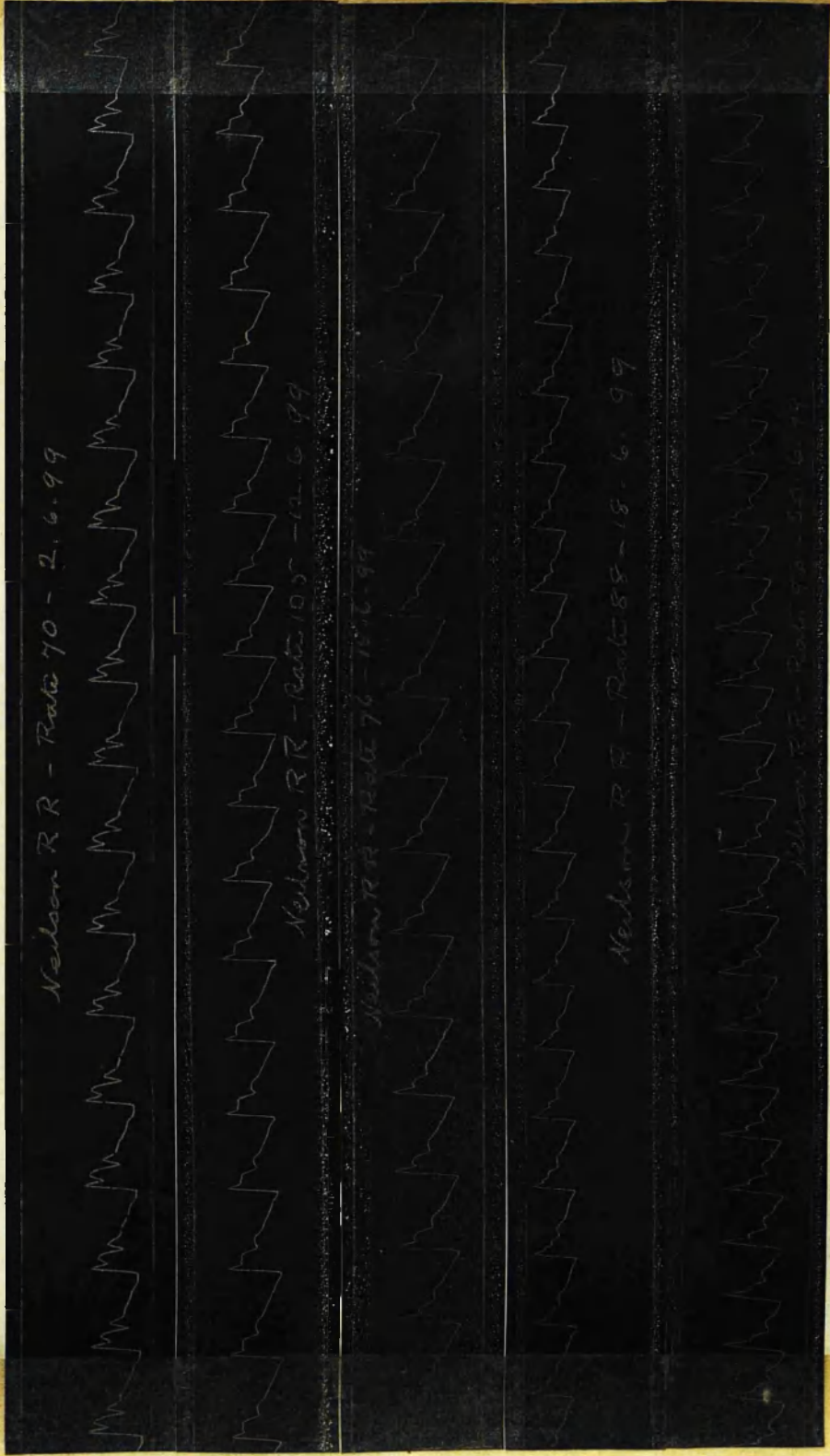
ing is dicrotism.

Tracing No. 2 was taken a month later, the white blood corpuscles having diminished so that the ratio was 1 white to 163 red. The percentage of haemoglobin, and the number of red blood corpuscles however were less satisfactory, the former remaining at 25%, and the latter slightly less than on admission, but notwithstanding this it may be observed that the tension has improved.

Tracing No. 3 was taken after another interval of a month, and though it represents a soft pulse it may be almost called a normal tracing. At this time the haemoglobin had increased to 50%, the red corpuscles to 5,024,000 per cubic millimetre, and the white corpuscles remained much about the same - 1 white to 146 red - and the patient was sufficiently improved to be dismissed. The beneficial result of arsenic in this case is extremely interesting, the disease as a rule being far from amenable to treatment, but whether the improvement is permanent, time alone will show.

The next series, Figure 18, was taken from
a case of Bright's Disease.

Figure 18.

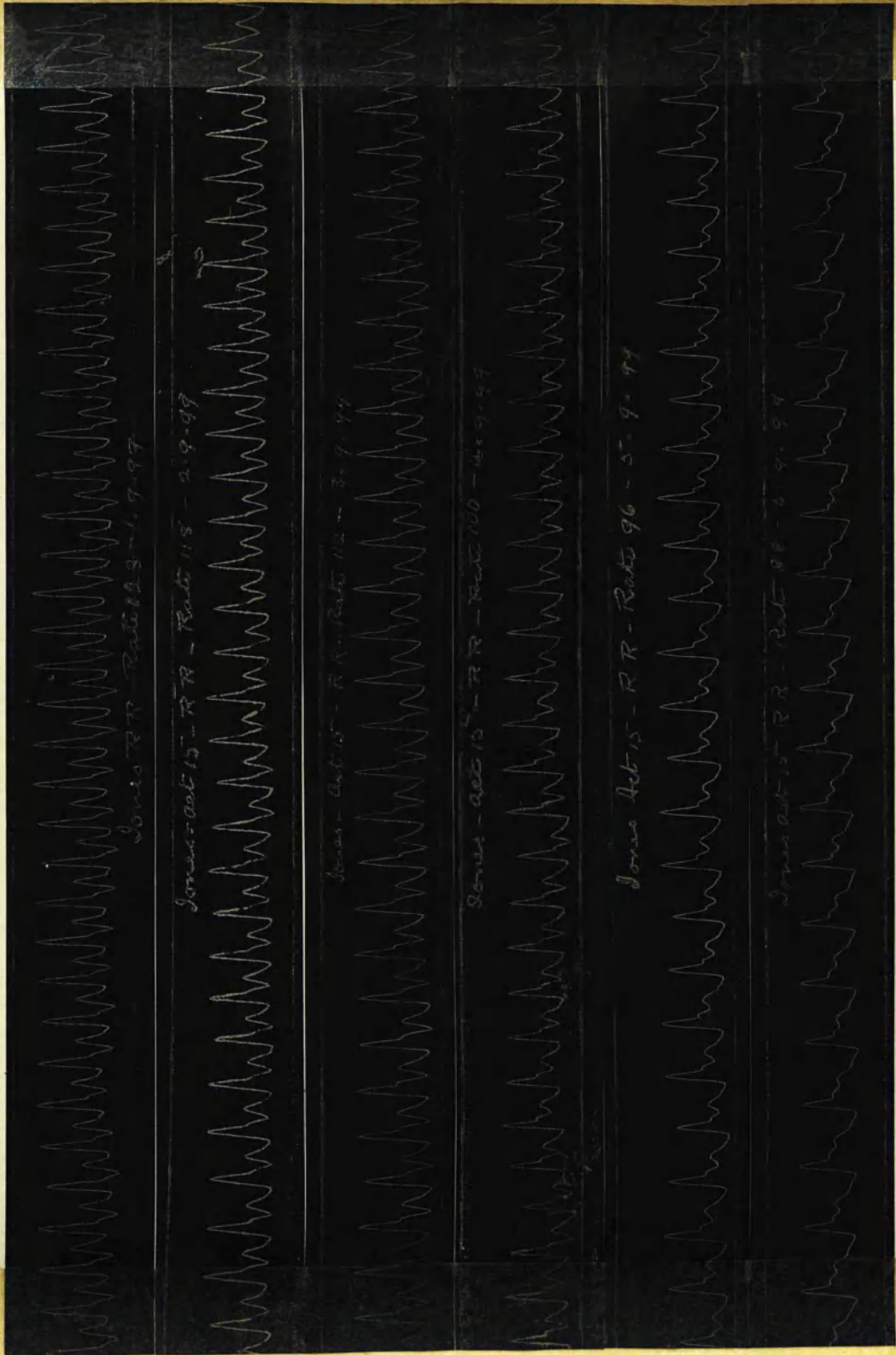


18

JOHN N., aet. 28, Ironturner. Admitted into the Western Infirmary with symptoms of Bright's Disease. Five months before admission he became the subject of frequent headaches, and a fortnight later his attention was attracted by the fact that he was passing water more frequently than he used to. In the course of six weeks his feet and ankles commenced to swell at nights, and he was compelled to give up work, and take to his bed where he remained under medical supervision up to admission. When admitted the oedema was slight being noticeable chiefly in the face. The urine was free from blood, but contained .15% of albumen. The treatment consisted of a milk dietary and potus imperialis ad libitum. He was in addition given tinct. ferri perchlor M 10 thrice daily and was dry cupped over the kidneys every third day. A notable reduction in arterial tension resulted, as will be seen by inspection of the tracings, the albuminuria becoming fractional, and the urinary output constantly being over 100 ounces.

The next series, Figure 19, was taken from a case of enteric fever.

Figure 19.



No 1

No 2

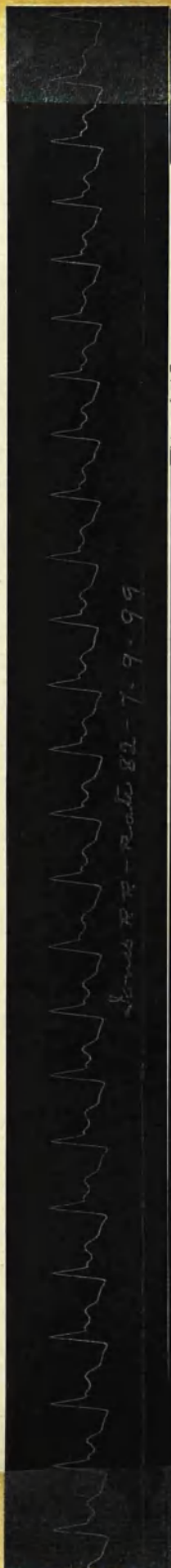
No 3

No 4

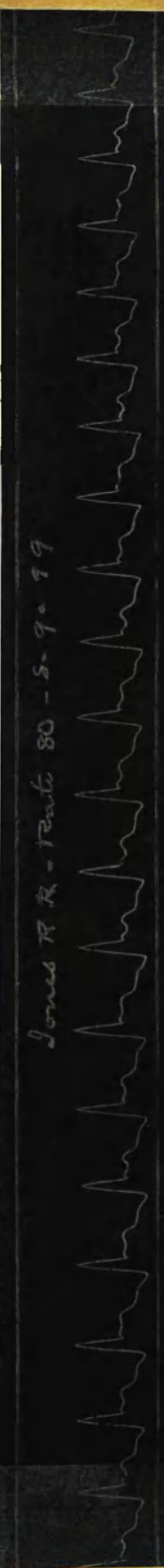
No 5

No 6

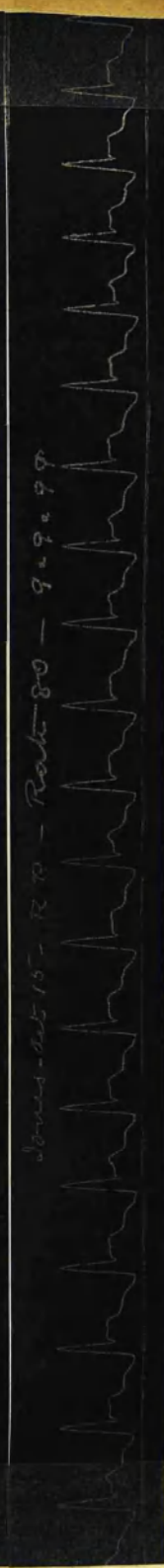
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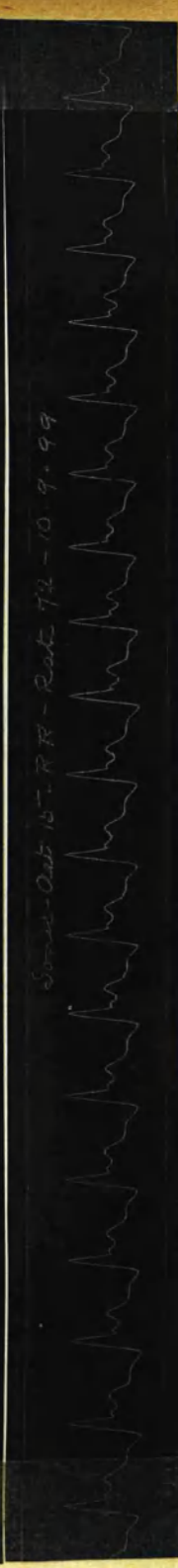
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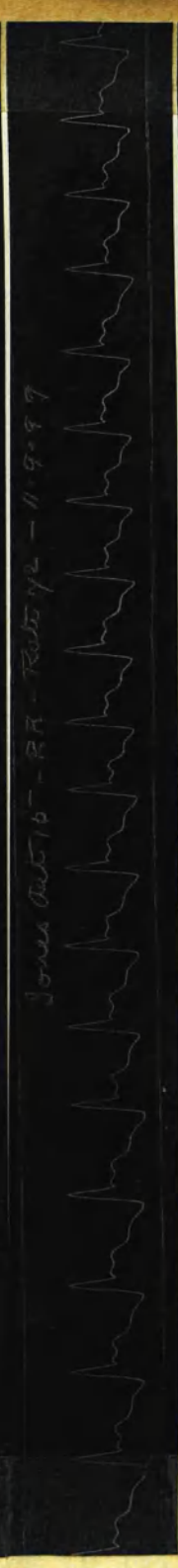
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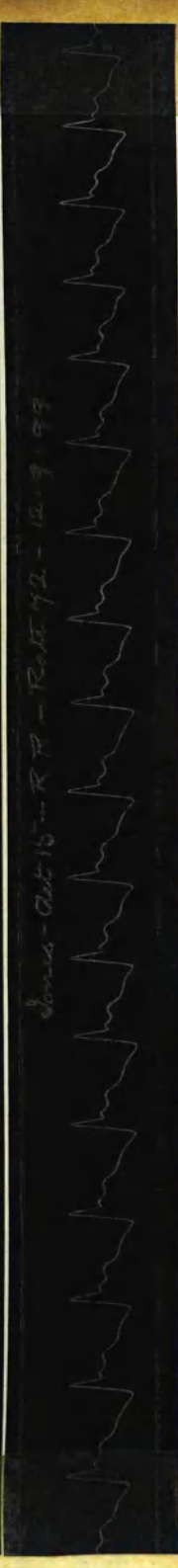
No 10



No 11



No 12



ROBERT J., aet. 15. Admitted into the Western Infirmary complaining of general weakness, with cough and expectoration. The boy had been sent to the hospital as a case of pneumonia, but the day after admission a rash made its appearance, which, with an enlarged spleen, and his general prostration made it quite evident that the case was one of enteric fever. The blood was submitted to Widal's test, and gave a very characteristic reaction. The onset of his illness was indefinite. The morning and evening temperatures ranged between 100.8 and 103 for three days, and then gradually fell, to become normal three days later. There was no diarrhoea at any time during the illness. The treatment in this case was purely dietetic.

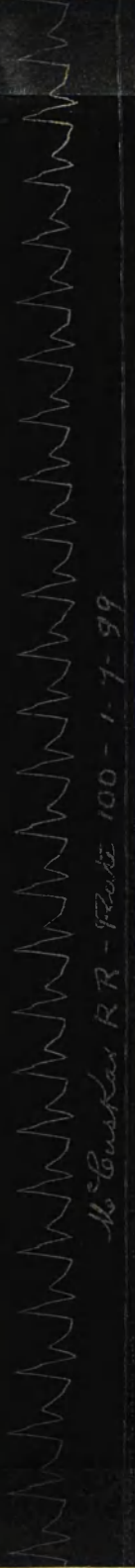
Tracing No. 1 represents the pulse on admission, and is slightly hyper-dicrotic, the rate being 123. The next three tracings are fully dicrotic, after which the tension begins to improve. At tracing No. 5 the temperature reached normal in the morning, rising in the evening to 101.6, and

from No. 6 onwards, both morning and evening, records remained normal. The pulse, however, even at tracing No. 12 was still a little soft.

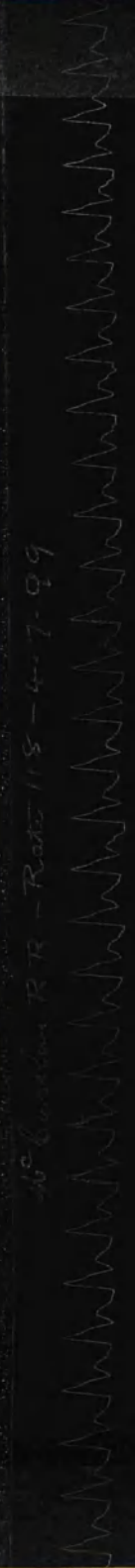
The foregoing series were taken from cases the treatment of which was followed by improvement. A few series are now presented where the reverse took place. The first of these, Figure 20, was taken from a case of pneumonia.

Figure 20.

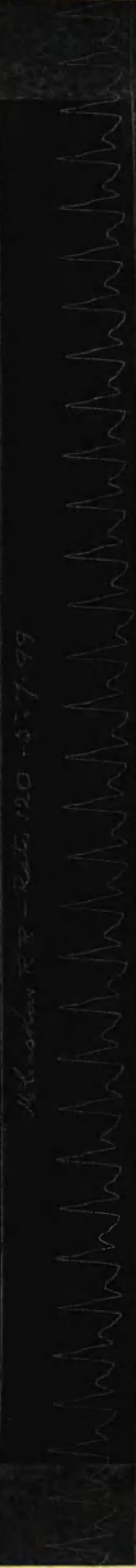
No 1



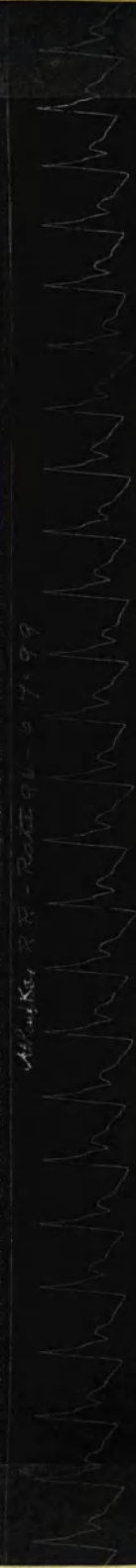
No 2



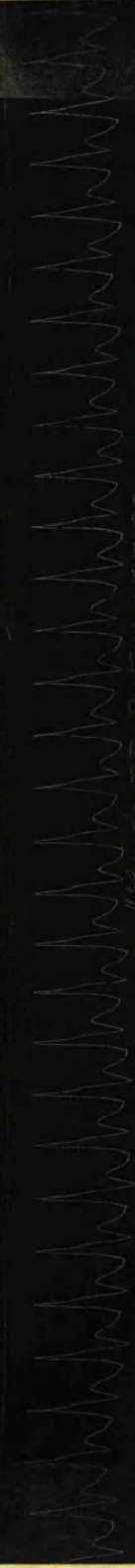
No 3



No 4



No 5





No 108

No 109

No 108

No 108

MICHAEL McC., aet. 20, Labourer. Admitted into the Western Infirmary complaining of headache, and a pain having pleuritic characters of two days' duration. Upon admission the pulse was regular, dicrotic, 100 in rate, the respirations numbering 28. The temperature registered 104, the urine had a distinct trace of albumen, and there was slight evidence of friction in the right supra-mammary region. These were the only abnormal physical signs. In twenty-four hours violent delirium set in necessitating restraint with the exhibition of chloral, and the following day signs of solidification of the right apex became plainly manifest. The temperature maintained its high level for several days reaching 105, but on the eighth day of the illness the crisis occurred.

Tracing No. 1 represents the pulse on admission the main characters of which are full dicrotism.

No. 2 was not taken until three days later, owing to the delirium, and it with No. 3, presents

similar characters. At this stage digitalin gr. 1/240 in the form of granules was commenced every six hours, and the tracing taken on the following day - No. 4 - shows distinct signs of improvement. It was here however the crisis occurred, to which the improvement in tension and rate was doubtless mainly attributable. Everything pointed to a satisfactory termination, the temperature was normal, and the consolidation presented signs of resolution, but unfortunately the temperature rose the following evening to 104, and became associated with a swelling in the right parotid region. Full diastole returned, and the pulse again became rapid as shown on tracing No. 5. The parotid swelling increased in size and went on to suppuration. Incision and free drainage was resorted to, but wandering delirium set in, and death eventually took place from septicaemia eight days after the appearance of the parotitis. In the last tracing No. 9, the pulse was intermittent, and the volume diminished, this was two days before death, subsultus tendinum inter-

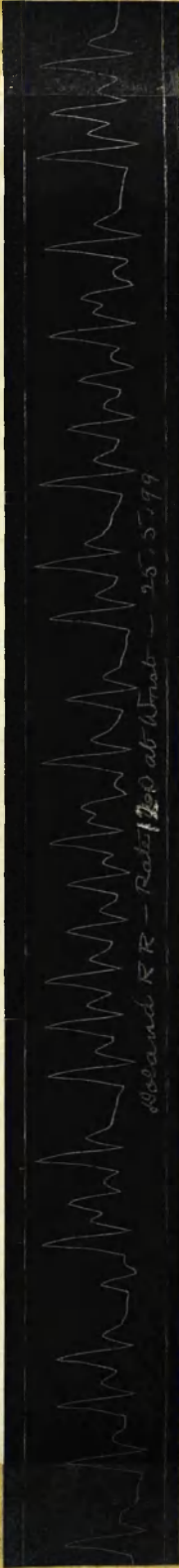
fering with further records.

The next series, Figure 21, was taken from a case of tubercular pericarditis.

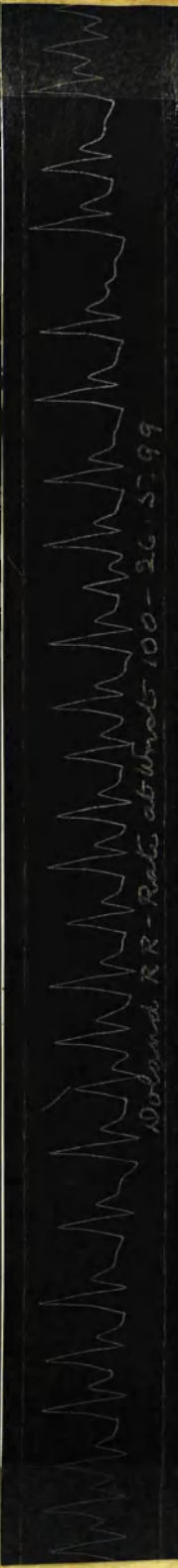
Figure 21.



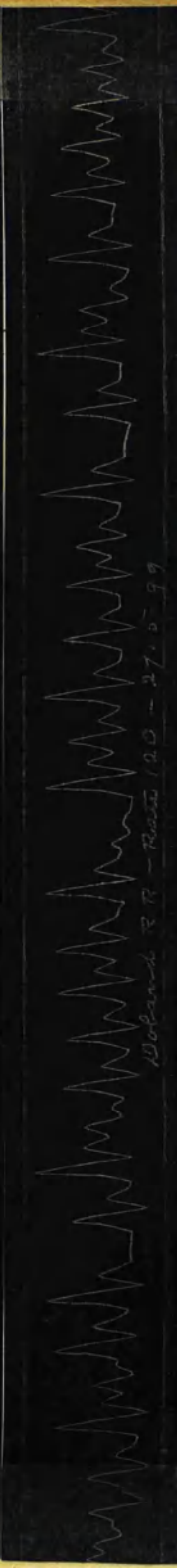
No 6



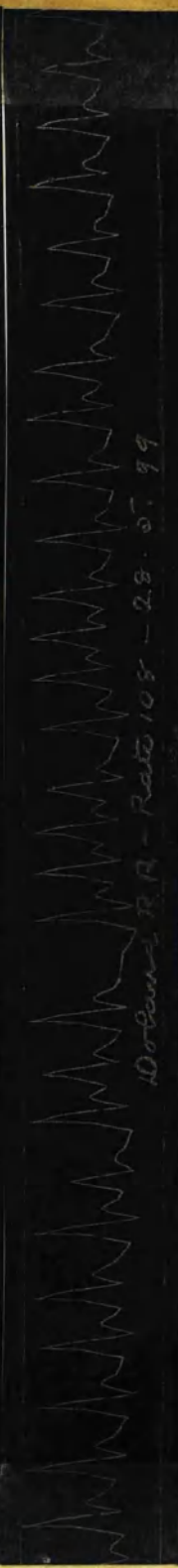
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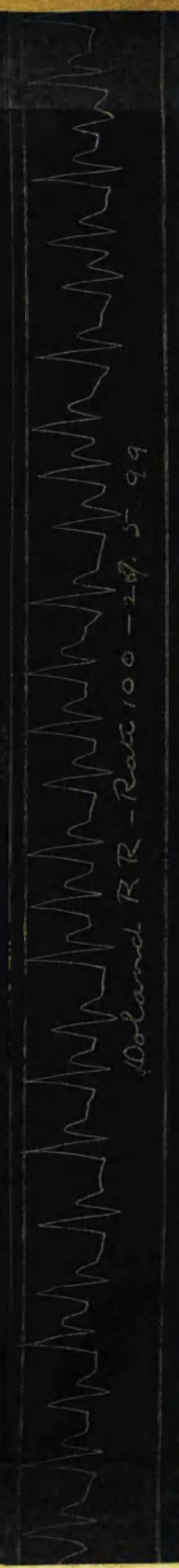
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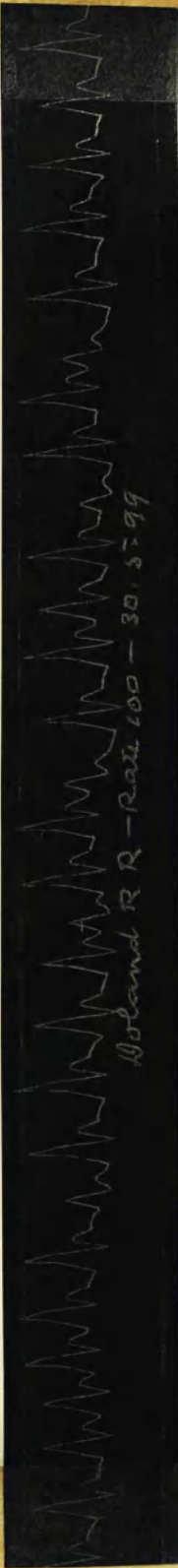
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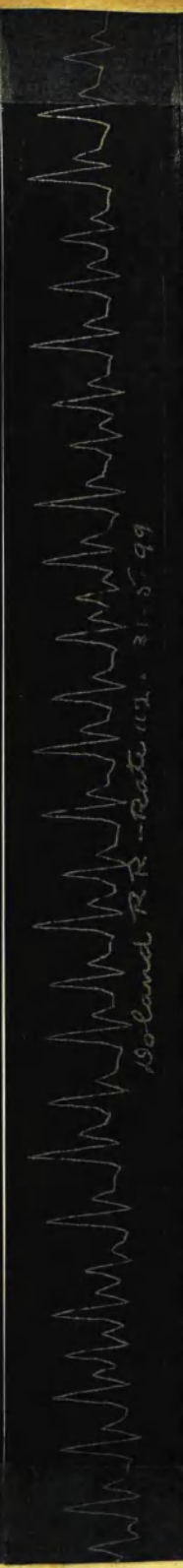
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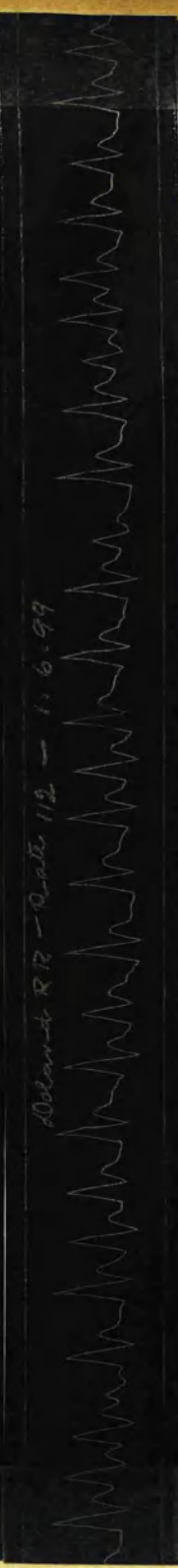
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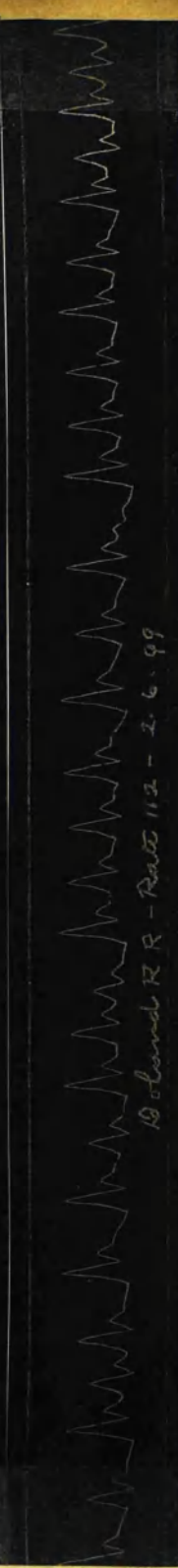
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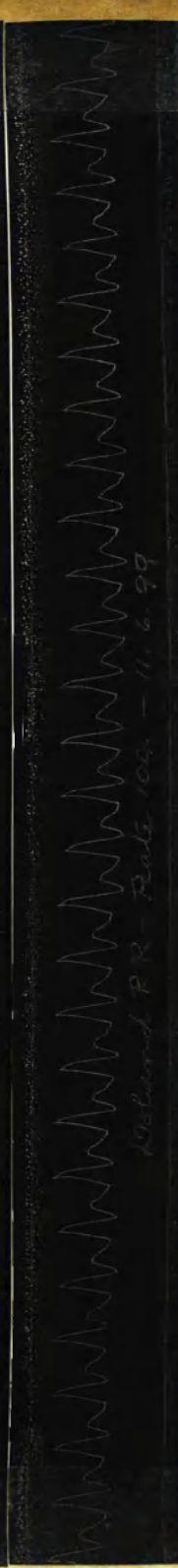
No 13



No 14



No 15



JAMES D., aet. 36, Labourer. Admitted into the Western Infirmary complaining of cough, dyspnoea, and pain in the chest. A detailed statement was difficult to obtain as he appeared to have paid little attention to his symptoms, but as far as could be ascertained he enjoyed good health up to six months before admission when he began to suffer from cough with expectoration, the latter without special characters. In reply to the question of pain in the chest, he stated that it had troubled him for several weeks, but its exact situation was difficult to determine, as was also a history of acute onset. An aggravation of this pain, however, occurred five days before admission, and on that occasion he referred its site to the precordium. He remained at his work until a fortnight before he was admitted when in consequence of dyspnoea and increasing weakness he was compelled to give it up. Upon admission the respirations numbered 26, and were associated with considerable distress. The pulse was markedly irregular, and of low tension registering 96 at the wrist, while at the heart 126 beats were recorded. There was slight

evidence of cyanosis. Upon examination of the heart the apex beat was neither visible nor tangible. The precordial dulness formed a cone shaped area, the apex of which reached as high up the sternum as the level of the first interspace, the right border extending to within $\frac{1}{2}$ " of the right nipple, and the left border transgressing the left nipple line by 2". Transverse measurement 12 inches. The cardiac sounds were almost inaudible. Examination of the lungs revealed evidence of fluid in both pleural sacs, that on the left extending up to the angle of the scapula, while the right sac was occupied by a much smaller quantity. Well marked pleural friction was present in the left lateral region, and both dry and moist rales were audible all over the chest. The urine contained no pathological constituents. The temperature registered 102 on admission, and remained febrile during the whole course of the illness.

Tracing No. 1 was taken on admission, after which an alkaline mixture was commenced every four

hours, and 2 oz. of whisky every two hours. The tracing is markedly irregular and like some of the following ones presents some characteristics which though not conforming exactly to the pulsus paradoxus, at all events suggest such a type. There was a considerable discrepancy between the number of heart beats and the pulse as counted at the wrist, but owing to the feeble character of the heart sounds it was impossible to record the former with precision. At tracing No. 5 tinct. digitalis M X every two hours was commenced, and the tracings that follow show slight improvement both in volume and regularity, but the pulse has become hyper-dicrotous. Local applications of linseed and mustard were applied to the precordium, but without effect, the effusion increasing rather than diminishing. Fluid was more than once removed from the pleural sacs, but it re-accumulated and the patient ultimately died, death being preceded for a couple of weeks by general anasarca. The last tracing was taken eight days before death, and is the most regular

of the whole series. Further tracings were not attempted owing to the cough, and the restless condition of the patient. A post mortem examination revealed evidence of wide spread disseminated tubercular disease. The pericardial sac contained bloody fluid, and the heart itself with the adjacent pericardium presented a very marked plastic exudation, unusually vascular. The pleurae also gave evidence of tubercular inflammation, and the lungs were studded throughout their substance with miliary tubercles, several small cavities in addition being present at the apices. The glands at the bifurcation of the trachea, and at the root of the right lung were the seat of much older tubercular mischief suggesting a primary focus. There was tubercular perihepatitis, and also marked tubercular peritonitis of recent date. Most of the viscera presented miliary tubercles throughout their substance.

This series of tracings is a particularly interesting one, and contrasts very well with Figure 14 and Figure 15. All three were taken

from cases of pericarditis, the two first however being simple in nature, while this was tubercular in origin. In this one the heart was not only hampered by the excessive effusion and exudation, but the cardiac muscle was involved in the tubercular process, and its function more seriously interfered with, hence the very marked irregularity.

Figure 22.

No 1

Aitken RR - Rate Wrist 108 - Heart 130 - 30.5.99

No 2

Aitken RR - Rate Wrist 84 - Heart 112 - 31.5.99

No 3

Aitken RR - Rate Wrist 100 - Heart 120 - 1.6.99

No 4

Aitken RR - Rate Wrist 92 - Heart 120 - 2.6.99

No 5

Aitken RR - Rate Wrist 98 - Heart 112 - 3.6.99

No 6

4.6.99 Atrial RR - Rate about 112 Heart 150

No 7

Atrial RR - Rate about 96 Heart 142 - 6.6.99

No 8

Atrial RR - Rate about 112 Heart 132 - 7.6.99

No 9

Atrial RR - Rate about 100 Heart 120 - 8.6.99

JESSIE A., aet. 48, Sempstress. Admitted into Western Infirmary suffering from dyspnoea, palpitation, and swelling of the feet. She had a rheumatic history, and had been in hospital on two previous occasions during the last six years with symptoms similar to those from which she suffered on admission. Her present attack began ten days before admission, though she had been more or less breathless for some time previous. When admitted there was considerable orthopnoea, and well marked oedema of the feet and ankles. The pulse was regular and small, numbering 108 at the wrist, while at the heart 130 beats were recorded. Respirations 30. Examination of the heart revealed the apex in the fifth interspace, in the nipple line. The right border of the precordial dulness extended half an inch beyond the right sternal margin. Transverse measurement 5". A well marked thrill was present at the apex, pre-systolic in rhythm. The cardiac sounds presented at the apex a long rough murmur filling up nearly the whole of the long pause, increasing in intensity as it ran up to the first sound, where it terminat-

ed abruptly. Following the first sound was a soft systolic murmur increasing in intensity as the xiphoid was approached, over which it assumed a much rougher character. Over the base the second pulmonary sound was accentuated. There was effusion into both pleural sacs, and friction was, in addition, detected in the left lateral region. The urine contained .28% of albumen. On admission a mixture of tinct. ferri perchlor. M X, liq. arsenici hyd. M 4, and liq. strychninae M 4 was commenced thrice daily. The oedema, however, increased rather than diminished, and as orthopnoea persisted 45 ounces of fluid were withdrawn from the left pleural sac, and four days later 35 ounces from the right, considerable improvement in the breathing resulting. At this time, however, she developed symptoms of pulmonary infarctions, the sputa becoming uniformly blood-stained. As the urinary output remained small her mixture was stopped, and one of tinct. digitalis M X, and caffein cit. gr. V substituted, and the daily amount of urine speedily rose to over 100 ounces.

With this her condition began to improve, but she died suddenly with symptoms of further embolic mischief in the lungs. A post mortem examination confirmed the diagnosis, the mitral valve admitting only one finger. A large thrombus was found in the left auricle evidently of recent origin, and haemorrhagic infarctions were found in both lungs. Upon inspection of the tracings it will be seen how the cardiac condition failed to respond to treatment.

In tracing No. 1 22 beats of the heart failed to reach the wrist, while in tracing No. 6 there were 38. The irregularity became more marked and the pulse more rapid.

The next series, Figure 23, was taken from a case of myocardial degeneration.

Figure 23.

No 1

No 2

No 3

No 4

No 5

U.S. RR - Rpt 163 - 14-7-99

U.S. RR - Rpt 164 - 14-7-99

U.S. RR - Rpt 165 - 14-7-99

///

WILLIAM M., aet. 73, Night Watchman. Admitted into the Western Infirmary complaining of dyspnoea, anasarca, with cough and expectoration. His symptoms began six months before, when he commenced to suffer from dyspnoea on exertion, followed by cough and expectoration, and in the course of a month by oedema of the arms and legs. He had always enjoyed good health previous to the onset of his present symptoms. On admission he presented some degree of cyanosis, and suffered from respiratory distress, the breathing being of the Cheyne Stokes character. The pulse was extremely small, of low tension, 128 in rate, and the accessible arteries were markedly degenerate. Pitting on pressure was obtained over the limbs and trunk. Upon examination of the heart the apex beat was neither visible nor tangible, and the precordial dulness was bounded above by the third rib, to the right by the left sternal margin, and to the left by a line $3\frac{1}{2}$ " from mid-sternum. Transverse measurement 3". The cardiac sounds indistinct at the apex were inaudible over the base, and were heard loudest over the right ven-

tricle. They were muffled in character, but free from murmur. The left pleural sac presented evidence of fluid, the upper border of which reached the lower angle of the scapula. Over the remainder of the chest bronchitic rales were well marked. The urine was scanty, loaded with urates, but free from albumen. Upon admission he was given a mixture of tinct. digitalis M 8, and caffein cit. M 5, every four hours, and on the following day the dyspnoea was considerably relieved, the oedema, however, remaining as on admission. Two days later he became much more breathless, and paracentesis thoracis was resorted to, 55 ounces of fluid being removed from the left pleural sac. This, however, only brought temporary relief, and notwithstanding stimulation with strychnine hypodermically he died the following day.

Tracings Nos. 1 and 2 were taken on admission. In the former the effect of Cheyne Stokes respiration on the pulse is well represented, the period of apnoea being marked by a diminution in rate and an increase in volume. In No. 2 the

period of apnoea is not shown, the tracing showing an extremely small, rapid, low tension pulse, though with no tendency to irregularity. The digitalis and caffein cit. was then commenced and an improvement in the next tracing is manifest. This, however, was only temporary, and an increase in rate occurred, No. 4 registering 140, and No. 5 165. It was after this tracing was taken that paracentesis thoracis was performed, and patient died the following day.

In considering these series of tracings in connection with their cases it cannot but be admitted that notwithstanding the various objections put forward to its use, the advent of the sphygmograph is a distinct advance in medicine. Its aid to memory and the means it affords of obtaining

indelible records of the pulse from day to day are beyond question, but of still more importance is the manner in which it enables the effect of treatment to be watched and recorded, and in the training of students it has almost become a necessity. Unfortunately it is only in Hospital that it can be used to any great extent, as the facilities in private practice are not such as to make its use practicable. In taking these tracings Dudgeon's instrument only, was used. It has the recommendation of being the least expensive, and it may be added the most convenient, though its method of application is capable of improvement. Owing to the strap that goes round the wrist being attached to one end of the instrument, the other end has a tendency to tilt up, and in many cases the results are unsatisfactory. Better results are obtained by loosely fixing the strap and holding the instrument on the artery by the thumb and index finger of both hands, having an assistant to attend to the smoked paper. It would be more convenient if the instrument had a strap at each

end so that the operator could have both hands free to attend to the smoked paper, and the assistant thereby could be dispensed with.

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