The Haematinic Action of Iron in Anemia of Old Age.

Robert Mackinlay M.B. C.M. (1882)
The following observations and experiments were made for the purpose of determining whether the administration of Iron, in any of its various forms, would be attended with beneficial effects in Anaemia of Old Age, the term Anaemia being used in the sense of that condition of Blood in which from any cause, ascertainable or not, the number of Red Corpuscles has become diminished, or where there is a diminution in the amount of Haemoglobin, or where these two coexist.

Every one is familiar with the rapid improvement so frequently seen in adults and adolescents in one or other of these forms of Anaemia, after a short or longer use of Iron in medicinal doses, but I am not aware that the subject has received in the Aged, adequate investigation, if indeed any investigation at all.

In the authorities on the therapeutical action of Iron, it is mentioned as a suitable remedy in Old Age. It may be that its administration has been followed by headache produced by overfilling of Blood vessels, and thus believed to favour the tendency to Apoplexy; or it may have been thought that it would give rise to gastric or intestinal disturbance; but as will be shown there is reason for affirming that these undesirable effects are not much, if at all more common in the Old than they would be in an equal number of Young adults.

The Blood in Old Age must suffer deterioration along with the other shrinking and wearing-out organs; but just as one organ
may suffer more than another, so sometimes the blood may suffer more than the other tissues.

There are many cases among old people where anaemia is present, although not perhaps to the marked extent in which it is seen in the chlorotic girl. A few of these may be mentioned, as in some forms of Cardiac Disease or in cases where there is a discharge of long standing, or where the digestion is imperfect, as due to want of teeth to masticate the food; or more directly still, as from actual loss of food, as seen for example in cases of bleeding piles, several of which have come under my observation lately.

The subjects of these observations are inmates of Lichfield Workhouse. Some of them are under sixty years of age; many of them are seventy and a few are over eighty. In choosing those on whom the effects of the iron were to be observed, some were chosen who, from their appearance and general condition were thought likely to be benefited by such a remedy, while a few were apparently in good health at the time of administration, and were so to speak taken as control experiments to the others.

All these had previously been under observation for some months, a few for over two years, so that ample opportunities had been afforded for becoming acquainted with their state of health.

As far as was possible the diet was the same in all the cases in which the effects of the iron were noticed. This consisted of three
meals in the day; the first at seven in the morning, the second at noon, and the third at six o'clock at night. The following table will show of what that diet consisted.

<table>
<thead>
<tr>
<th>Breakfast</th>
<th>Dinner</th>
<th>Supper</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BREAD</td>
<td>BUTTER</td>
</tr>
<tr>
<td>MEN</td>
<td>7 1/2</td>
<td>1 1/2</td>
</tr>
<tr>
<td>WOMEN</td>
<td>6 1/2</td>
<td>1 1/2</td>
</tr>
</tbody>
</table>

This diet did not vary from one day to another, and while this was the case with those who had what was called "full diet," i.e. meat once a day during every day in the week, the other inmates aged sixty years and over had a diet which did alter as a glance at this table will show.

<table>
<thead>
<tr>
<th>Breakfast</th>
<th>Dinner</th>
<th>Supper</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BREAD</td>
<td>TEA</td>
</tr>
<tr>
<td>Monday &amp; Tuesday</td>
<td>MEN</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>WOMEN</td>
<td>6</td>
</tr>
<tr>
<td>Wednesday &amp; Thursday</td>
<td>MEN</td>
<td>same as before</td>
</tr>
<tr>
<td></td>
<td>WOMEN</td>
<td></td>
</tr>
<tr>
<td>Saturday</td>
<td>MEN</td>
<td>same as before</td>
</tr>
<tr>
<td></td>
<td>WOMEN</td>
<td></td>
</tr>
<tr>
<td>Sunday &amp; Thursday</td>
<td>MEN</td>
<td>same as before</td>
</tr>
<tr>
<td></td>
<td>WOMEN</td>
<td></td>
</tr>
<tr>
<td>Wednesday</td>
<td>MEN</td>
<td>same as before</td>
</tr>
<tr>
<td></td>
<td>WOMEN</td>
<td></td>
</tr>
</tbody>
</table>
In these cases, where any alteration in diet existed or had been necessitated, the same had been duly mentioned.

All the subjects were also under precisely similar conditions as regards rest and exercise. The ventilation in sitting rooms and dormitories was carried out on the same plan, and the occupants of these were limited to a certain, and as far as possible a uniform number.

The methods employed to estimate the number of Red Corpuscles and the amount of Haemoglobin were those of Dr. Pears, his Haemacytometer and Haemoglobinimeter. Although it is not claimed that these are absolutely reliable, they are quite sufficiently so for all clinical purposes.

The Blood for examination was obtained by making a puncture in the palm of the hand towards its ulnar side. This was found to be more convenient than puncturing the pulp of the fingers which in the aged is so often shrivelled and consequently does not readily give the amount required.

A few cases - about six were selected and a specimen of Blood taken from the place mentioned above was subjected to examination. The number of Red Corpuscles in one cubic millimetre of Blood was estimated by means of the Haemacytometer and the amount of Haemoglobin by the Haemoglobinimeter. In regard to the first a dilution of five cubic millimetres of Blood in nine hundred and ninety-five cubic millimetres of a Solution* of Soda-

* This solution is made by dissolving 52 grms of Soda sulphate in one ounce of distilled water.
Sulphate is taken and the number of Red Corpuscles in a known volume of this dilution is counted. The number in one cubic millimetre can then be easily calculated. In the case of the Red Colouring Matter, the test is a colorimetric one. There are two tubes of equal dimensions in one there is a standard dilution of blood of one part in one hundred; and the other tube is graduated in tenths and units up to one hundred. So that average normal blood would, when diluted with water, be read off at one hundred. The Blood to be examined then is diluted with distilled water, and compared with the standard, the water being cautiously added drop by drop until the tubes in the two tubes are precisely similar; the percentage of Haemoglobin will then be marked off on the graduaded glass.

It was observed that the Red Corpuscles in all the cases, taking five millions to the cubic millimetre as the normal average, were quite as numerous as that normal, and in some cases considerably above this, while the Haemoglobin in no instance reached that of the healthy adult. It has been pointed out by some investigators that the amount of Haemoglobin diminishes in old age, but by how much this is diminished is not made clear. As ample material for examination and comparison existed in the workhouse, an attempt was made to find this out, at least approximately. The Blood of a considerable number of old people—fifty in all—was examined in the manner just described; and the results of these examinations are here given.
REVIVAL these have been arranged in a tabular form. Appended to each is a short statement of the condition of health at the time of examination. From a comparison of these cases, it seems that in the aged, the standard or average amount of hemoglobin is decidedly less than in the adult. Taking one hundred as the standard of the latter, that of the former would be something about eighty-five or a little lower; in other words, the normal amount of hemoglobin in a given amount of blood is three-twentieths or perhaps even the fifth less in the aged than in the young adult.

As regards the hemacutees it will be noticed that these vary very much in number, in some being as high as between six and seven millions to the cubic millimetre, while in others it falls to four and a quarter millions. Still it cannot be said that there is anything like a deficiency in any of the cases.

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Sex</th>
<th>Age</th>
<th>R. Corpuscles</th>
<th>Hemoglobin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Joseph Lucas</td>
<td>M.</td>
<td>65</td>
<td>5,060,000</td>
<td>75</td>
<td>88</td>
</tr>
<tr>
<td>2</td>
<td>Mary Atten</td>
<td>F.</td>
<td>79</td>
<td>4,860,000</td>
<td>70</td>
<td>82</td>
</tr>
<tr>
<td>3</td>
<td>J. Smith</td>
<td>M.</td>
<td>60</td>
<td>5,540,000</td>
<td>70</td>
<td>82</td>
</tr>
<tr>
<td>4</td>
<td>John Atten</td>
<td>M.</td>
<td>68</td>
<td>6,250,000</td>
<td>75</td>
<td>88</td>
</tr>
<tr>
<td>5</td>
<td>Joseph Atten</td>
<td>M.</td>
<td>76</td>
<td>4,920,000</td>
<td>75</td>
<td>88</td>
</tr>
<tr>
<td>No.</td>
<td>Name</td>
<td>Sex</td>
<td>Age</td>
<td>Rank</td>
<td>Service No.</td>
<td>Date of Birth</td>
</tr>
<tr>
<td>-----</td>
<td>---------------</td>
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<td>-----</td>
<td>------</td>
<td>-------------</td>
<td>---------------</td>
</tr>
<tr>
<td>1</td>
<td>John Smith</td>
<td>M</td>
<td>20</td>
<td>2000</td>
<td>JSM12345</td>
<td>1952-01-01</td>
</tr>
<tr>
<td>2</td>
<td>Jane Doe</td>
<td>F</td>
<td>30</td>
<td>2010</td>
<td>JDE67890</td>
<td>1982-02-02</td>
</tr>
<tr>
<td>3</td>
<td>Michael Brown</td>
<td>M</td>
<td>35</td>
<td>2005</td>
<td>MBN34567</td>
<td>1987-03-03</td>
</tr>
</tbody>
</table>

*Note: Description column includes medical and physical condition details.*
<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Sex</th>
<th>Age</th>
<th>R.Corporules</th>
<th>Hemoglobin.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>George Loffil</td>
<td>M</td>
<td>60</td>
<td>5,620,000</td>
<td>78, 91</td>
<td>Suffers from Chronic Rheumatism.</td>
</tr>
<tr>
<td>22</td>
<td>Rebecca Richardson</td>
<td>F</td>
<td>58</td>
<td>4,620,000</td>
<td>50, 58</td>
<td>Start and flabby.</td>
</tr>
<tr>
<td>23</td>
<td>H. Chessie</td>
<td>M</td>
<td>66</td>
<td>5,800,000</td>
<td>85, 100</td>
<td>Healthy at this time.</td>
</tr>
<tr>
<td>24</td>
<td>Ahmed Baiday</td>
<td>M</td>
<td>65</td>
<td>6,090,000</td>
<td>64, 75</td>
<td>Healthy but of weak intellect.</td>
</tr>
<tr>
<td>25</td>
<td>Theo Chapman</td>
<td>M</td>
<td>68</td>
<td>5,270,000</td>
<td>60, 70</td>
<td>Healthy.</td>
</tr>
<tr>
<td>26</td>
<td>Theo Stinjef</td>
<td>M</td>
<td>60</td>
<td>5,180,000</td>
<td>52, 61</td>
<td>Suffers from epilepsy. Must avoid a good deal - was a soldier.</td>
</tr>
<tr>
<td>27</td>
<td>Theo Blashnutt</td>
<td>M</td>
<td>66</td>
<td>4,950,000</td>
<td>79, 92</td>
<td>Suffers from Chronic Rheumatism.</td>
</tr>
<tr>
<td>28</td>
<td>Chas. Stubbie</td>
<td>M</td>
<td>76</td>
<td>5,490,000</td>
<td>78, 91</td>
<td>Healthy.</td>
</tr>
<tr>
<td>29</td>
<td>Jas. Reville</td>
<td>M</td>
<td>79</td>
<td>5,660,000</td>
<td>83, 97</td>
<td>Healthy.</td>
</tr>
<tr>
<td>30</td>
<td>H. Deakin</td>
<td>M</td>
<td>68</td>
<td>4,590,000</td>
<td>80, 94</td>
<td>Suffers from Chronic Rheumatism.</td>
</tr>
<tr>
<td>31</td>
<td>Cath. Currell</td>
<td>F</td>
<td>60</td>
<td>5,490,000</td>
<td>56, 65</td>
<td>Stout and flabby.</td>
</tr>
<tr>
<td>32</td>
<td>Hy. Worthdale</td>
<td>M</td>
<td>75</td>
<td>4,820,000</td>
<td>83, 100</td>
<td>Suffers from Chronic Rheumatism.</td>
</tr>
<tr>
<td>33</td>
<td>Jas. Bellington</td>
<td>M</td>
<td>78</td>
<td>4,850,000</td>
<td>66, 77</td>
<td>Healthy.</td>
</tr>
<tr>
<td>34</td>
<td>Michael Hahth</td>
<td>M</td>
<td>61</td>
<td>5,250,000</td>
<td>35, 41</td>
<td>Looks very emaciated - has rheumatism. Came in a good step.</td>
</tr>
<tr>
<td>No.</td>
<td>Name</td>
<td>Sex</td>
<td>Age</td>
<td>R. Corpuscles</td>
<td>Hemoglobin</td>
<td>Description</td>
</tr>
<tr>
<td>-----</td>
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</tr>
<tr>
<td>35</td>
<td>Benj. Benton</td>
<td>M</td>
<td>67</td>
<td>5,030,000</td>
<td>65</td>
<td>76</td>
</tr>
<tr>
<td>36</td>
<td>Ed. Haukejet</td>
<td>M</td>
<td>84</td>
<td>4,700,000</td>
<td>77</td>
<td>90</td>
</tr>
<tr>
<td>37</td>
<td>James Rowley</td>
<td>M</td>
<td>73</td>
<td>5,120,000</td>
<td>65</td>
<td>76</td>
</tr>
<tr>
<td>38</td>
<td>Richd. Simpson</td>
<td>M</td>
<td>71</td>
<td>5,390,000</td>
<td>75</td>
<td>88</td>
</tr>
<tr>
<td>39</td>
<td>Ann Priest</td>
<td>F</td>
<td>76</td>
<td>5,090,000</td>
<td>70</td>
<td>82</td>
</tr>
<tr>
<td>40</td>
<td>Thos. Sharp</td>
<td>M</td>
<td>84</td>
<td>4,420,000</td>
<td>66</td>
<td>77</td>
</tr>
<tr>
<td>41</td>
<td>Thos. Honney</td>
<td>M</td>
<td>74</td>
<td>5,570,000</td>
<td>78</td>
<td>91</td>
</tr>
<tr>
<td>42</td>
<td>Thos. Word</td>
<td>M</td>
<td>77</td>
<td>5,760,000</td>
<td>76</td>
<td>89</td>
</tr>
<tr>
<td>43</td>
<td>Isaac Bentley</td>
<td>M</td>
<td>77</td>
<td>5,030,000</td>
<td>68</td>
<td>80</td>
</tr>
<tr>
<td>44</td>
<td>John Harvey</td>
<td>M</td>
<td>64</td>
<td>4,970,000</td>
<td>61</td>
<td>71</td>
</tr>
<tr>
<td>45</td>
<td>Mary Ashley</td>
<td>F</td>
<td>75</td>
<td>5,190,000</td>
<td>72</td>
<td>84</td>
</tr>
<tr>
<td>46</td>
<td>Thos. Sheldon</td>
<td>M</td>
<td>76</td>
<td>5,620,000</td>
<td>74</td>
<td>87</td>
</tr>
<tr>
<td>47</td>
<td>Isaac Evans</td>
<td>M</td>
<td>68</td>
<td>5,430,000</td>
<td>76</td>
<td>89</td>
</tr>
<tr>
<td>48</td>
<td>Thos. Read</td>
<td>M</td>
<td>66</td>
<td>4,870,000</td>
<td>61</td>
<td>71</td>
</tr>
<tr>
<td>49</td>
<td>Thos. Basaltal</td>
<td>M</td>
<td>84</td>
<td>6,060,000</td>
<td>80</td>
<td>94</td>
</tr>
<tr>
<td>50</td>
<td>Jes. Bellez</td>
<td>M</td>
<td>70</td>
<td>5,460,000</td>
<td>76</td>
<td>89</td>
</tr>
</tbody>
</table>
In reviewing the results in this Table, it must be remembered that while many of those marked "healthy" were undoubtedly free from any actual disease, a considerable number of them had been at one time or other exposed to various vicissitudes and privations, while some of them had been intemperate. It is worthy of remark that in those who suffered from Chronic Rheumatism—a condition which is very common here and which in many of the cases is accompanied by debility—it is not only a matter of remark that in most of them the average was relatively high. While this was so with Chronic Rheumatism, Acute or Subacute Rheumatism seemed to be attended by a diminution in the number of Red Corpuscles and Red Colored Matter as seen in Case No. 23. Of course this is what might be expected, and probably the same conditions of blood would in the Aged, as in the Young, be found after any acute illness. The question is however outside of the scope of this paper.

Out of the cases here enumerated several were chosen and put on medicinal doses of iron either in the form of a Ferric or Ferrums A mixed preparation. The Citrate of Iron and Ammonia was given to most of them while the Ferrums Sulphate was in the first instance given to one only. Of these taking the Ammon. Citrate—the most robust—was given a dose of ten and one-half grains three times a day, equivalent to six grains of Iron per day; and to the other three a dose equal to half this amount. The one, taking the Ferrums Sulphate, had a dose of five grains
given three times a day. In one of these the Ammoniac Citrate of Iron No. 2. (in one case like the others will be given more in detail) the medicine could not be tolerated; while the others took it uninterruptedly for periods varying from six to fourteen weeks.

In four of these—Nos. 4, 5, 6, and 7.—the Citrate of Iron & Ammonia only was given; while to the other three—Nos. 1, 3, and 8. This was given for a period of ten weeks, the Sulphate being afterward administered for from four to six weeks. Here the dose of the Sulphate was five grains three times a day equivalent to three grains of Iron per day.

The Ammoniac Citrate was chosen on account of its mildness as an astringent, and also on account of the convenience with which it can be administered. The chief drawback to the use of the Sulphate, namely its rapid decomposition when dissolved in water, was greatly prevented by using distilled water as a solvent, and adding to a mixture containing sixty grains of the salt, one fluid drachm of glycerine. This was found to keep for nearly a week with scarcely any change of colour, and very little deposit.

In all of these cases the number of Red Corpuscles was estimated once a fortnight as also the amount of Haemoglobin. This was compared with the previous examination and duly chronicled while the examination was confined as nearly as possible to the ascertaining of this effect on the Red Corpuscles, and Red Blooded Matter, any manifest contraindication to the use of Iron was
closely watched for, and all undesirable symptoms if present were carefully noted.

A detailed account of each case will not be given followed by any practical conclusions which it may be possible to draw from them.

Case No. 2. Mrs. Cotton aged 79 years, a widow. The body of this patient was fairly well preserved considering her years. She had been during the last nine months two or three times under treatment for a feeling of nausea with vomiting. As however this had generally been traced to an error in diet— which in the case of patients who have friends outside is rendered possible by these bringing in various forbidden articles of food, and as this had always passed off in a few days when she was carefully watched and dieted, little heed had been paid to it.

With the exception of these occasional attacks of sickness and which had not been complained of for some time, there was nothing apparent which would lead one to believe that the administration of small doses of iron would be harmful, although calcification in the Radial or Temporal arteries was considerably advanced. In addition it should be said that the pulse was very slow and that occasionally there was a systolic murmur in the aortal area.

Examination of the Blood gave the results mentioned in the General Table. viz.

<table>
<thead>
<tr>
<th>Number of Red Corpuscles</th>
<th>4,560,000 to 1 Cubic Mm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of Haemoglobin per cent.</td>
<td>70. or Corrected 82.</td>
</tr>
</tbody>
</table>
In all the cases, it will be given the amount of tannin per cent as compared with the adult, and after it, the amount which it is reasonable to believe coincides more with that which is the normal average in the aged.

After taking six doses of the Ammonio-Citrate of Iron, each of five and one quarter grains, the patient began to complain of headache, and the medicine was discontinued. The mixture of the Perchloride was then tried in doses of twenty minims thrice a day; but this also had to be abandoned due to the headache being intensified. Other unpleasant symptoms also showed themselves as abdominal pain and fulness.

It was evident then that this was not a suitable case.

Two months after this the patient began to complain of severe pain in the abdomen. The pain was worst over the epigastrium but extended also into the right and left hypochondriac regions, and indeed at times appeared to be all over the abdomen. No improvement was observed after careful dieting; instead of this, the pain seemed to be increased after eating, and there were frequent attacks of retching and vomiting after the taking of food. She began to lose flesh. The pain was increased by pressure; the liver dulness was apparently enlarged; and over the painful part there was an unmistakable increase in the feeling of resistance. The tongue was constantly covered with a milky-looking film, and the urine was scanty and loaded with urates.

While pain was constantly present, it was much worse at times than others, and when so severe, it
was only relieved by opiates. From all these symptoms and from the fact that there was a history of vomiting of blood a short time before he came under the care of the hospital with probable secondary affection of the liver was diagnosed.

I mention this rather fully as it is quite possible that this condition, which was perhaps already partly developed when the iron was first given, accounted for some extent at least for its being taken so badly.

The next case (No. 6) Joseph Hackett, aged seventy years, was formerly a farm labourer, and had been an "out and in" inmate of the workhouse for some years. He was a very round-shouldered old man, his back being so much bent forwards as to look like a deformity. His head and body looked to be too large for his shrivelled limbs. He said that he had had no illness except that when ten years of age a piece of timber fell on him and this caused the curving of his back. At another time he was crushed by a horse which necessitated his keeping his bed for a week.

This patient had been a hard liver, drinking according to his own statement, large quantities of ale but never spirits. He had his weak knees on both legs for many years. These had been better from time to time but had again broken out due to bruises, want of cleanliness, etc.

At the time when he began taking the iron, he complained of feeling pains throughout the body, but most severely across the chest. His statements
However were not considered very reliable. He once attempted to commit suicide, after which he was confined in an Asylum for some time. In the last year or two his intellect had been rather weak. He was very emotional, one day declaring with tears that he would die of the pain in his chest, and at another time, feeling easier, he would talk hopefully of his recovery.

Here was however at this time, nothing in his appearance to indicate disease, except that he had lost a little flesh during the three or four months previously.

His digestion was not very good, but the tongue was clean. He had entirely lost his teeth, these having come out of themselves. There was occasional retching and vomiting, the cause not being always apparent. The bowels were much constipated, seven to eight days passing without any action. There was slight pain on pressure over the left hypochondriac region. The liver in the right mammary line was diminished, that in the liver dulness was, and the lower line of the dulness was raised somewhat. The abdominal walls were full contrasting with the thin legs. Over the thorax as well as the abdomen was a considerab-- layer of fat under the skin. On the legs beside the ulcers mentioned on their scars there were a few spots of a purpuric nature. The chest sounds cardiac and respiratory seemed quite healthy. The urine contained phosphenes and had a slightly ammoniacal odor. There was no albumin and no sugar present. In short as was said before there were no positive signs of disease. Yet there must have been great pain in the chest at times.
For, at his own request, he had frequently had applied turpentine strips or mustard plasters. These relieved him for a time.

Examination of the blood gave the results mentioned in the Table viz.: Number of Red Corpuscles in one cubic millimetre .......... 6,170,000.

Amount of Haemoglobin per cent. ................ 55...corrected...64.

The Haemocytes although thus very numerous were much smaller in Haemoglobin than they ought to have been, in fact being little more than half their normal value. Many of them were smaller than usual even the larger giving when measured by the micrometer an average diameter of 7.1 micromillimetres.

A dose of five and a quarter grains of the AmmoniAclate of Iron was given three times a day. This was taken regularly during the next six weeks, the blood being examined at the end of each fortnight. At the end of the second week the number of Red Corpuscles had fallen to 5,630,000 to one cubic millimetre. The Haemoglobin being also slightly diminished, 52 per cent or corrected 61 per cent.

At the end of the fourth week there was a still further and more marked fall in the number of the Red Corpuscles the number being 4,720,000 to one cubic millimetre.

The Haemoglobin was apparently the same as before.

At the end of the sixth week the number was for Red Corpuscles 4,710,000 to one cubic millimetre, while the amount of the Haemoglobin had gone down to 45 per cent or corrected 53.

As it was thought possible that the Iron might...
be partly responsible for this, its use was abandoned.

At the end of the eighth week and again at the end of the tenth (and during this time nothing in the shape of medicine being given) there was found to be a slight rise in the number of Red Corpuscles and then a decided fall again, while the amount of the Haemoglobin increases a very little; thus,

At end of 8th week.

No. of Haemopyle 5,350,000 per 1 Cub. mm.  
Amount of Haemoglobin 48 per cent, corrected 56.

At end of 10th week.

No. of Haemopyle 4,640,000 per cub. mm.  
Amount of Haemoglobin 49 per cent, corrected 57.

As further examinations were made.

But I must now state the general condition of the patient during these weeks, and the more easily obtainable effects on the system at large. At first it seemed as if the skin would be well borne, and that benefit might be derived from its use. There was no gastric uneasiness complained of, although the old pain across the precordial and mammary regions came on from time to time.

The tongue remained quite clean, no inkiness to be noticed; the appetite improved a little; and the bowels, previously so much constipated, acted once a day or oftener, the motions of converse being very dark. After taking the medicine for ten days or so, a little cough came on, and this persisted more or less while it was given. In addition to this there was occasionally slight frontal headache. The loss of flesh seemed still to be going on, and he soon became so weak as to be unable to stand alone. At the end of a month's
course of the iron, nausea and vomiting showed themselves once or twice. These sometimes came on after food, sometimes after medicine. The appetite for food began to fail considerably, and he complained of pain for some time after eating. After all medicine was left off he still grew weaker, keeping his bed altogether. The cruta disappeared while the bowels continued to act regularly. The pain in the chest was still present sometimes being very severe.

In this case then 660 grms of the Ammon. Citrate of iron were taken, equivalent to 126 grms of iron, and this was spread over a period of 42 days. Apparently it all passed off in the bowel, and during this time there was distinctly an increased destruction of Red Blood Corpuscles. Whether this was in any way jarried by the use of the iron it would be difficult to say. In this subject the iron seemed to cause a sort of intestinal catarrh as evidenced by the frequency of the motions compared with the condition of marked constipation which had preceded it. The daily amount of urine excreted remained about the same during the whole period of observation.

A chart is here given which is intended to shew more graphically the course of the case. The percentage of Red Corpuscles — taking five millims to the cubic millimetre as the standard — and the percentage of Haemolytins are separately marked at each time of examination. To give it an appearance of continuity, these marks are united by lines just as one would do in a temperature chart. That representing the Haemacytes is marked by a dotted line and the Haemolytins
in plain lines, the red cell meant to represent the corrected percentage; the black being that compared by o or measured with the adult average.

It is to be noted here that a rise or fall in the amount of the haemoglobin while in the main following a similar change in the number of Red Corpuscles, did not by any means coincide with it.

Case No. 6. Jo Hackett

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Haemoglobin marked in dotted line, Black the percentage compared with average in adult.

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The next case No. 7. Joseph Lucas aged 67 years was by occupation a laborer. He had been a very healthy man with the exception of one or two ulcers on one leg. These were first brought on by an injury and although sometimes quite healed up they were rarely so for any length of time. It had been his custom to come into the workhouse for the winter, have the ulcers healed and then go out again in summer only to return in the late Autumn in the same condition as before. This had gone on for many years.
Laterly however the ulcers did not heal thoroughly, and there was a considerable discharge of acid and irritating pus from them. He also complained of a little pain in the epigastric region after eating, this pain being accompanied with flatulence. These symptoms of indigestion were probably due to want of exercise for they disappeared when he was engaged at work. He had previously been of intemperate habits.

The blood was examined with these results:

No. of Haemacytes in 1 cub. mm. 5,660,000.
Amount of Haemoglobin per cent. 75.

His diet was corrected. 88.

He was put on the Ammonium Citrate of Iron, 10 oz. being given three times a day. This was taken for a period of ten weeks, after which the Sulphate of Iron was given for six weeks. The blood was as usual examined once a fortnight, the results being as follows:

At end of second week,
No. of Haemacytes in 1 cub. mm. 5,120,000
Amount of Haemoglobin per cent. 75

corrected. 88

At end of fourth week,
No. of Haemacytes 5,000,000
Amount of Haemoglobin 81

corrected 95

At end of sixth week,
No. of Haemacytes 5,300,000
Amount of Haemoglobin 74

corrected 87

At end of eighth week,
No. of Haemacytes 5,150,000
Amount of Haemoglobin 73

corrected 85
At end of 10th week
No. of Haemocytes ............... 5,140,000
Amount of Haemoglobin .......... 73
   " corrected .......... 85

The Ammonia Citrate being now stopped and the Sulphate
of Iron being given in doses of 5 grains three daily,
At end of twelfth week
No. of Haemocytes ............... 5,050,000
Amount of Haemoglobin .......... 74
   " corrected .......... 87

At end of fourteenth week
No. of Haemocytes ............... 5,330,000
Amount of Haemoglobin .......... 71
   " corrected .......... 83

At end of sixteenth week
No. of Haemocytes ............... 5,260,000
Amount of Haemoglobin .......... 77
   " corrected .......... 90

Now here during the ten weeks in which the Citrate
of Iron and Ammonia was given, the quantity of
that preparation taken amounted to 2048 grms,
equivalent to 390 grms of metallic Iron, and the
result upon the number of Red Corpuscles and the
percentage of Haemoglobin was absolutely negative.
At the end of the fourth week there is a slight
rise in the amount of Haemoglobin but this was
not maintained, the next examination showing a
fall to the original percentage. Iron was there
nothing in the general condition of the body
which called for much notice. There was indeed at
times frontal and occipital headache, which might
have been due to the administration of the Iron;
in addition, there were at times sweets feeling in
the abdomen after eating; but these were not of
any means so severe as to require special treatment, and passed off without any interruption in the taking of the medicine. In this case there was a tendency to constipation, which was combated by adding a little Sulphate of Magnesia to his mixture.

Another matter may be of interest and that is, that the ulcers on the legs which had not healed for some years closed up all but a small point, and this although no more attention had been bestowed upon them than before.

As for the Sulphate of Iron which was taken for six weeks (600 grains being given equivalent to 120 grs. of metallic iron) no change was at first observed. At the end of the fourth week during which it was given (the fourteenth week since the commencement of the administration of iron) there was a slight rise in the number of the Red Corpuscles, namely a rise of 6 per cent. but coincidently with this was a fall in the amount of the Hemoglobin this going down to 71 per cent. or corrected percentage 83. At the end of the sixth week a slight rise in the amount of the Hemoglobin is observable. It is to be remarked in connection with the Ferric Sulphate, that although not so agreeable as the Ammoniac-Citrate, it was quite as well borne as that preparation. The tendency to cause constipation was also about the same in each of them.

Subjoined is a chart similar to that in the preceding case, namely the dotted line representing the Red Corpuscles, while the plain line is meant to represent the changes in the Hemoglobin.
Case No. 3. Mr. Smith aged 63 years, a farm labourer by occupation, has been an inmate of the Workhouse for over twenty years. He was early left an orphan, and had apparently been weak from his birth. He gave a history of jaundice and other illnesses. Like so many of this class he had a few ulcers on the legs. In most of the cases here, I believe the cause of these ulcers is want of cleanliness. A bruise or a cut may be received, no attention is given to it, the stocking or clothing is allowed to stick in, and a chronic sore is soon established.

During the time this patient had been under my care, he had an attack of Typhoid Fever, that disease being prevalent in the House at the
time; from this he recovered, but was still, as indeed he had always been, a weakly man.

His muscles were small and flabby, his ankles large and deformed, and the soles of the feet were flattened; altogether, he was a poorly developed man and mentally as well as physically, unqualified to battle with the world. His digestion was fair, and there were no physical signs of any actual disease.

Examination of the blood gave the following results:

No. of Hæmacytes

in 1 Cuf. millim. 5,540,000

Amount of Hæmoglobin 70 per cent. corrected .

per cent. 82 per cent.

A dose of the Ammonio-citrate of iron was given similar to that in the preceding case and with the same frequency. It was taken too for the same length of time and in these respects the two cases were so far identical that it is mere repetition to go over it again. In this case however the Ferrous Sulphate was given for 4 weeks only.

The results are here given

On 10 c.c. of the Ammonio-citrate thrice daily.

At end of second week.

No. of Hæmacytes per Cuf. mill. 5,420,000

Amount of Hæmoglobin per cent. 76. 89, corrected 89.

At end of fourth week.

No. of Hæmacytes 5,460,000

Amount of Hæmoglobin 76. 89, corrected 89.

At end of sixth week.

No. of Hæmacytes 6,270,000

Amount of Hæmoglobin 69, corrected 81.
At the end of the eighth week,

- No. of Haemacytes: 5,600,000
- Amount of Haemoglobin: 66 boxing

At end of 10th week,

- No. of Haemacytes: 5,410,000
- Amount of Haemoglobin: 66 boxing

The Ammonis citrate stopped, and the Sulphate given in doses of 5 grains three times a day.

At end of twelfth week,

- No. of Haemacytes: 5,380,000
- Amount of Haemoglobin: 63 boxing

At end of fourteenth week,

- No. of Haemacytes: 5,420,000
- Amount of Haemoglobin: 62 boxing

The amount of Ammonis citrate of iron taken then was equal to that in the preceding case, but the amount of the Ferrous Sulphate taken was only 320 grains, equivalent to 64 grains of metallic iron, the administration of this and any other form of iron being discontinued at the end of the fourteenth week.

Looking over the results, it will be seen that although there was at first a slight rise in the amount of the Haemoglobin and a little later a decided rise in the number of the Red Corpuscles, this rise was only temporary, and the aftereffects of the case was of a backward nature, the diminution in the amount of the Haemoglobin being very decided.

There was little worthy of notice in the general
condition of the patient during the first two months of observation, towards the end of the third, however, the appetite began to fail a little; there was slight abdominal pain, and constipation became rather marked; this last was especially seen when the Sulphate of Siro was given. As when there seemed to be no likelihood of this case being benefited in any further use of the Siro; as the Haemoglobin was a little diminished, and as the above mentioned symptoms were beginning to manifest themselves, its use was abandoned. Still it cannot be said that this patient was to any serious extent if at all, injured by the use of the Siro. Like as in Case No. 1, the ulcers on the legs healed up entirely. A chart is given as figure, the crosses marking when the Ammoniac citrate was stopped and the Sulphate commenced.

**Case No. 3. H. Smith.**

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Haemoglobin in dotted line. Black, as compared with young adult.
Haemoglobin in plain line. Red, omitted among old age.
Case No. 4. John Collins, aged 68 years, has been a groom. As in so many other of the cases, the winter was spent by him in the workhouse, summer seeing him out again in search of work. While he had this, he would probably have sufficient to eat and drink, and in this way he would spend all his earnings. These men, however invariably came back to the workhouse in a worse condition physically than they left it.

The patient was a well-made man, rather under average height, and fairly muscular. His general health was good, no signs of any disease being present.

The blood was examined with the following results:

- No. of Hemacytes per cubic mm. 6,250,000
- Amount of Hæmoglobin per cent 73.6
- corrected 78

The usual dose of Arsenic Album of 1 grain was given 3 times a day. This was taken for a period of fourteen weeks. During that time he took about 3,000 grains equivalent to 595 grains of metallic arsenic. There was no intermission in the administration.

Results of examinations:

- At end of second week
  - No. of Hemacytes: 5,880,000
  - Amount of Hæmoglobin: 78
  - corrected: 79

- At end of fourth week
  - No. of Hemacytes: 5,870,000
  - Amount of Hæmoglobin: 77
  - corrected: 79

- At end of sixth week
  - No. of Hemacytes: 6,430,000
At end of sixth week
Amount of Haemoglobin 78
creased 91.

At end of 8th week
No. of Haemacites 5,750,000
Amount of Haemoglobin 75
creased 88.

At end of tenth week
No. of Haemacites 6,060,000
Amount of Haemoglobin 70
creased 82.

At end of twelfth week
No. of Haemacites 5,430,000
Amount of Haemoglobin 66
creased 77.

At end of fourteenth week
No. of Haemacites 5,370,000
Amount of Haemoglobin 68
creased 80.

The results of these examinations then showed that during these fourteen weeks, there was at first a slight rise in the amount of the Haemoglobin, and then a fall, the difference between the quantity at the end of that time and the quantity at the beginning being about 8 per cent. In regard to the Red Corpuscles there seemed to be for a time a sort of oscillation (see Chart) but here too in the end there was a decided fall, the last examination giving as compared with the first, a reduction of nearly 20 per cent.

There was, however, no deleterious effect exercised on the health of the subject. At first there was a little loss of appetite for food, which probably
had nothing to do with with the Stone, as it soon passed off. There was, though, once again the tendency to constipation, but not to any greater extent than is frequently met with in the average adult taking this preparation. With the exception of this, he expressed himself as feeling perfectly well. A chart is given as before.

Case No. 4 John Collins.

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The lower figures in the chart are omitted to save space.
Homoeptes marked by dotted line as before.
Homosemen marked in plain lines as before.

Case No. 5. Jacob Wilson, aged 76 years, had been a very powerful man. At one time had been rather intemperate but not of late.

He had a massive chest, and well proportioned limbs. Although the muscles had become rather flabby, the veins was still fairly well nourished, there being a considerable amount of Subcutaneous fat.

There was incommensurate of the cardiac value of the heart with hypertrophy of the ventricles. The latter has been failing of late and dilatation was
Taking place. In consequence of the incompetency of the initial valve, there was naturally backwash pressure on the lungs, and also at this time a little evidence of this backwash pressure on the portal system as well as the veins of the legs. As a result of this condition of the circulation, the dyspnoea or slight exertion diabetes was present almost always a little bronchial catarrh with frothy watery expectoration. The lips were slightly cyanosed and the digestion was not so good as it had been, this condition being doubtless due to the stasis in the portal system of vessels. The pulse was very weak, rapid and irregular. There was, at the time of examination of the blood, no dropsy in the legs. During the two years he had been under my care, he had had several attacks of cardiac failure. In the usual way he "got about" every day, but when these attacks came on—which they sometimes did—the symptoms developed themselves very rapidly; he had to take to bed, assuming the sitting posture. The dropsy in the legs which before he only noticed towards night became very marked; so was the dyspnoea. There was also cardiac pain, and very troublesome cough with abundant watery sputum. He had then also complete loss of appetite. The urine would be scanty. A few days rest in bed with the administration of Digitalis and Strychnia set him up again. When he was selected as one of these cases, he had not had one of these attacks for nearly six months.

The blood was then examined with these results:

- RBC: 4,920,000
- Hemoglobin: Per 1 cubic millimeter
Amount of Haemoglobin per cent. 75. on average.

Thus the Haemacytometer values 5 millions to the cubic millimetre as the average. Were quite as numerous as usual but the Haemoglobin was about 12 per cent under. At this time as I have said he was feeling very well. The digestion was pretty good, and the precordial pain of which he usually complained, was very slight.

As before, a dose of 10½ grains of the Ammonio-Citrate of Iron was given three times a day. This was continued for twelve weeks; in all he took about 2,500 grains equivalent to 530 grains of metallic iron.

The results of the fortnightly examinations are here given:

At end of second week,
- No. of Haemacytometers 6,040,000
- Amount of Haemoglobin 80
- Cremated 94

At end of fourth week,
- No. of Haemacytometers 6,730,000
- Amount of Haemoglobin 81
- Cremated 95

At end of sixth week,
- No. of Haemacytometers 6,330,000
- Amount of Haemoglobin 79
- Cremated 92

At end of eighth week,
- No. of Haemacytometers 5,930,000
- Amount of Haemoglobin 81
- Cremated 95

At end of tenth week
- No. of Haemacytometers 5,510,000
At end of tenth week
Amount of Haemoglobin........ 79
    corrected ... 92

At end of twelfth week
No. of Haemacytes........ 5220,000
  Amount of Haemoglobin........ 84
    corrected ... 98

This was the last examination made in this case. What will at once be noticed here is the rapid rise in the number of the Red Corporades, until the maximum was reached at the end of the fourth week; after this there was a steady fall which was continuous. In the amount of the Haemoglobin on the other hand there was a slow but steady rise from 75 to 88 per cent. (Corrected by standard in Old Age from 84 to nearly 99 per cent.) And in this case the state of the general health during these weeks was as far as it had been during the previous six months. Subjoined is the chart.

Case No.5 Joseph Wilton.

The lower figures omitted to save space.
Haemacytes marked as dotted line.
Haemoglobin marked in plain lines.
At first a little Digitalis in the form of the mixture was combined with the Iron (would this make any difference in the action of the latter?) but this was not continued for more than a week or two, the Ammonium Citrate only being given. In this case there was not so much constipation produced as in the other mentioned.

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Case No. Sarah Adie aged 68 years. She was a woman of weak intellect, and had been an intimate for many years. In her youth she has worked as a dairy hand, but having left all her friends, and her room becoming gradually more affected, she was put into the workhouse.

The patient was a woman of medium height, of spare build, and had a very anemic look. She suffered from Prolapse of Uterus which was said to have supervened on Childbirth. This was so marked that the bowel came down whenever she assumed the upright position, and when at stool it became ready as large as a newly-born child, head. At these times there was profuse bleeding from the distended and constipated vessels.

There was little doubt but that her anemic condition was due to this cause.

In some months it had been found necessary to keep her in bed, at least as far as possible prevent her from walking about. Streaming at stool was also forbidden, and as a result of these precautions the hemoglobin during that time had been comparatively slight. Examination of the Urine revealed a low average of Hemoglobin and a rather high percentage of Red Corpuscles.

Thus, in U. Hæmaturiae 5,650, 000 per cubic mill.

Amount of Hemoglobin 58 per cent., or

considered by standard for Old Age, 68 per cent.
She was then given 5½ grains of the Ammonia citrate three times a day, in a period of 14 weeks, during which time she took 1472 grains equivalent to 280 grains of iron.

Here are given the results of the examination:

At end of second week,
No. of Haemacytes per cub. mm. 6,220,000
Amount of Haemoglobin per cent. 65

At end of fourth week,
No. of Haemacytes 6,220,000
Amount of Haemoglobin 71

At end of sixth week,
No. of Haemacytes 6,040,000
Amount of Haemoglobin 75

At end of eighth week,
No. of Haemacytes 6,370,000
Amount of Haemoglobin 75

At end of tenth week,
No. of Haemacytes 6,630,000
Amount of Haemoglobin 76

At end of twelfth week,
No. of Haemacytes 6,330,000
Amount of Haemoglobin 84

At end of fourteenth week,
No. of Haemacytes 6,530,000
Amount of Haemoglobin 84

In this case there was in both the number of Red
Capsules and in the amount of the Haemoglobin, an
undoubted improvement; the former increased from
110 to 130 per cent. i.e. an increase of 20 per cent.
While the Haemoglobin showed a still more decided
change rising from 58.0 (68) per cent. to 84 (98) per
cent. Throughout the course of this case there were no
unfavorable symptoms, except that the breath was
rather foul occasionally. There was no constipation. The
only point in which the dietary here was different was
that this patient had half a pint of beer daily with
her dinner. The chart is here given.

Case No. 7 Sarah Adie.

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Haematocrit marked in dotted line.
Haemoglobin marked in plain line.

Case No. 8. H. Sanders

This man aged 62 years, was a gardener by oc-
cupation. He had been a man of temperate habits, but has
been unfortunate from a business point of view.
When first he came under my care two years ago, he
was suffering from attacks in the pneumonia, possibly the
result of a structure. Although very ill at this time, he recovered perfectly, only requiring the passing of a catheter once a month or so. During his convalescence, he had complete anaesthesia in one arm; the cause of this could never be made out. After this he rapidly gained strength and went out to work, staying but in perhaps about a year. At the end of this time he fell and bruised his knee, and having no means of subsistence he was brought again into the workhouse.

At this time, he was looking very pale and weak. He ascribed this condition to the want of sleep due to the pain in the leg. There was pain and slight swelling over the inner condyle of the femur, a little peritonitis being apparently present. To rest in bed and appropriate treatment the leg gradually got well.

Among other the blood of this man was examined and the following results obtained:

- No. of Haemacytometer per cubic mm. 4,890,000
- Amount of Haemoglobin per cent. 65, or corrected 76.

All the organs in the body seemed healthy and perfectly free of weakness, and worn out look had been caused by the pain in his knee, combined with loss of rest. There was no trouble in regard to the use of his digestion not very good at first, had improved very much.

He was given the Citrate of Iron and Ammonia in doses of 10 grains thrice daily. This he took for ten weeks.

At the end of this time, he was given the Sulphate in doses of 5 grains thrice daily for a period of four weeks.

Results of fortnightly examinations.

At end of second week

- No. of Haemacytometer ....... 5,090,000
- Amount of Haemoglobin ....... 68
  corrected: 80
At end of fourth week,
  No. of Haemacytes ............ 4,890,000
  Amount of Haemoglobin ....... 71%

At end of sixth week,
  No. of Haemacytes ............ 5,600,000
  Amount of Haemoglobin ....... 74%

At end of eighth week,
  No. of Haemacytes ............ 5,280,000
  Amount of Haemoglobin ....... 72%

At end of tenth week,
  No. of Haemacytes ............ 5,210,000
  Amount of Haemoglobin ....... 73%

At end of twelfth week,
  No. of Haemacytes ............ 5,260,000
  Amount of Haemoglobin ....... 76%

At end of fourteenth week,
  No. of Haemacytes ............ 5,010,000
  Amount of Haemoglobin ....... 69%

Here then were given 1920 grains of the Ammoni-citrate equivalent to 365 grains of metallic iron, and when this was stopped about 400 grains of the Sulphate equal to 80 grains of iron. Like the preceding case, although not so marked, there is here up to the twelfth week, a gradual rise in both the number of red corpuscles, and the amount of Haemoglobin. Of course it is not claimed that all this is due to the use of the iron, for doubtless the rest and regular dieting both favored this improvement. There were no bad symptoms
until the thirteenth week, if we except a little occasional mental indisposition: this was not so marked as to call for much notice. No constipation was present. During the thirteenth week of treatment, he was the misfortune to get a chill from having his bed placed where there was a draught. His temperature rose considerably, and in three or four days he had complete loss of appetite for food. These symptoms however soon passed off. It is to be remarked, that at the end of this period examination revealed a fall in the amount of hemoglobin.

After recovering from this, the patient left the lakh-house, so that no further observations could be made. As before, a chart of this case is here given.

**Case No. 8. W. Sanders**

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<th>No of Exam.</th>
<th>7th</th>
<th>8th</th>
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<td>Time in weeks</td>
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| First figure marked in dotted line.
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The X's mark the time when the preparation of iron was changed.

The last case No. 26. This Stenfor aged 60 years. He had been a soldier, and a good deal of his time had been spent abroad. Had never any illness such as ague 72.

This patient has been an inmate for some months. His general health was good. He occasionally however...
suffered from epistaxis. This was brought on by the most
violent causes as rubbing the nose, but the quantity
of blood lost was not excessive.

Examination of the Blood gave the following results:

No. of Haemacytes: 5,180,000 to 1 cub. mm.
Amount of Haemoglobin 52 per cent.

Corrected to standard %.

At end of first week

No. of Haemacytes: 5,650,000
Amount of Haemoglobin 60, or corrected 70 per cent.

At end of fourth week

No. of Haemacytes: 5,380,000
Amount of Haemoglobin 65, or corrected 78 per cent.

At end of sixth week

No. of Haemacytes: 6,460,000
Amount of Haemoglobin 75, or corrected 88 per cent.

Chart of Case No. 26. Mr. Slingsby.

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The above figures omitted to save space.
Haemacytes marked by dotted lines.
Haemoglobin marked by plain lines.
Here the increase in the number of the Red Corpuscles was no less marked than the increase in the amount of the Hemoglobin, the increase being more marked during the last fortnight. During all this time he was in very fair health, the effects of the Iron on the general condition of the body being apparently negative. It should be remarked that during the time he was under observation, there was very little epistaxis. Not much importance however is attached to this, as the amount of blood lost previously in that way was small, and the bleeding was not frequently enough repeated to cause much anaemia.

This was the last case experimented on.

Conclusions.

In looking over the results of these experiments it will be observed that they are largely of a negative nature; but even this is a matter of some importance, for it shows that, iron in ordinary doses, may be taken for long periods by even the very old with almost as much impunity as the young, if not with so signal benefit.

And then too, of those to whom it was given, only four were markedly anaemic to start with, viz., No. 6, 7, 8, and 26, and of these, the three last were apparently benefited. In Lucas (No. 1) the condition of the blood was scarcely at all affected. In Smith (No. 3), Hackett (No. 6), and Collins (No. 4) there was a fall in the number of the Corpuscles as well as in the amount of the Hemoglobin; but this would in all probability have occurred in Hackett had no iron been given at all, just as it shows little if any improvement after the medicine was discontinued. Collins (No. 2) could not tolerate it at all, showing...
that among the old, as among the young, there are individuals who cannot take iron in any form whatever, but even here substantial reasons are given in concluding that this intolerance might not have been natural.

In most of the cases there was a relation between the rise and fall of the Haemoglobin and the rise and fall in the number of the Haemacytes; but this was not constant. The Haemacytes were sometimes observed to be paler than usual under the microscope; this was especially noticed in the case of Collins (No. 4) when these were most numerous, the proportion of pale colored corpuscles to the more deeply tinted being larger than usual.

In one of the cases (Sanders No. 8) there was I have little doubt, an increase in the volume of the blood, even although there was not so marked an improvement in the quality.

Adie (No. 7) and Stimpson (No. 26) in both of which cases there had previously been haemorrhage, showed a marked improvement. It may seem then that anemia, caused by loss of blood, is more likely to be benefited by the use of iron than that due to other and unascertainable causes.

Besides all this it must be remembered that in the anemic adult or adolescent, we meet with cases where, although well borne, iron does not have a haematinic effect; so that it is not remarkable that in the aged a like condition may be seen occasionally.

From the account of these cases, it cannot be said that anything of a positive nature can be deduced of the comparative value of the different preparations of iron employed; the German Sulphate
not being obviously superior to the Ammonia-Citrate, but a wider experience and more extensive trial would be required to settle the point. That the Ferrous preparation as Krematmuc, are, when used in the grue, superior to the Ferrie in many cases, I consider has been conclusively proved.