December 19, 1938

Mr. F. E. Hart
Anaconda Wire and Cable Company
Marion, Indiana

Dear Mr. Hart:-

I have no doubt you remember the suggestions which I made at the time of my visit to your plant. However some of our observations indicated that there might be some factors in the lead absorption of your workmen which were not fully accounted for by my observations. Accordingly I have thought it best to make a brief report, giving you the benefit of all the data and information which we obtained and making such certain recommendations to you for the avoidance of further difficulties.

I have just heard from Mr. Shaner concerning the outcome of the suit against your company. I am not surprised at this result and, as a matter of fact, I think you are rather fortunate that the vereict was not larger. On the other hand I wish to confirm my belief, without which I would not have testified in this case, that this man did not have lead poisoning and that it was not a factor in his present disability. Of course he may have had some rather mild symptoms of plumbism at the time of his initial illness, but I doubt this, and there was no evidence in the record, so far as I saw, which justified one in making a diagnosis of lead poisoning. On the other hand, there was no proof that he did not have lead poisoning. This was the weakness in your case, since you were confronted with the testimony of at least two local doctors who believed that the symptoms were feferrible to lead absorption. This is the problem which all employers of workmen in the lead trades have to be able to meet. The diagnosis of lead poisoning is regularly made on the history of exposure; That is to say, the occupational history of the employee that indicates that he is engaged in work which involves some contact with lead-containing materials. The average doctor does not make any attempt to evaluate the magnitude of the exposure and he tends to ascribe any existing illness to the effects of lead absorption. If he is not straightened out at that time by a thorough study of the patient, which demonstrates

the facts one way or the other, he will thereafter hold to the conviction that his diagnosis was correct. It is, therefore, incumbent upon the employer to obtain medical assistance and advice which is more competent than that of the general practitioner of medicine. It is for this reason that I have made reference in the attached report to a means by which the facts can be obtained in doubtful cases of illness among employees. I think the time is coming and, in fact, not far away when employers in the hazardous trades will be compelled to exercise the utmost precautions in the avoidance of exposure. Despite this fact, I think there will be an increasing necessity for the utmost precision in the medical supervision of workmen in industry.

I trust you will find the report which I send herewith of some interest and value.

Very truly yours,

RAK:is

Robert A. Kehoe, M.D.

MAGNITUDE OF LEAD EXPOSURE IN MARION, INDIANA PLANT

OF

ANACONDA WIRE AND CABLE COMPANY

Air samples were taken in the immediate vicinity of a melting pot in which scrap lead from cables was being melted. Detailed observations were made over a period of an hour and a half in order to note the conditions which were most favorable for the distribution of particulate lead compounds in the atmosphere. It so happened that the end of one shift and the beginning of another came during these observations. This period involved the removal of dross from the melting pot, an operation which occurs once per day, and which involves much greater dissemination of dust than that associated with any other procedure. Air samples were taken from several points about the pot, at the height of the operator's face, during the period of normal operation. These samples were composited into Sample #1. Another series of samples, similarly combined as Sample #2 were obtained during the filling of the pot and during the removal of the dross.

The analysis of these samples yielded the following results:-

Sample #1 21,440.0 ml. contained 0.002 mg/Pb
equivalent to 0.09 mg. per cu. meter.

Sample #2 21,635.0 ml. contained 0.006 mg. Pb
equivalent to 0.28 mg. per cu. meter.

The values for particulate lead in atmosphere are usually expressed in terms of 10 cubic meters of air, and on this basis it is currently accepted that values in excess of 5

milligrams per 10 cubic meters are unsafe. Some workers give slightly lower values, in some instances as low as 1.5 milligrams per 10 cubic meters. The evidence, however, is very good in indicating that basic exposures as low as that involved in breathing air containing 2 milligrams of lead per 10 cubic meters, are substantially safe for all workers regardless of susceptibility factors.

On this basis of comparison the values observed in the vicinity of the pot may be regarded as indicative of safety, in that the basic lead concentration has appeared to be in the neighborhood of 1 milligram per 10 cubic meters, while the brief periodic exposure, during dressing and shoveling is of the order of 2.5 to 3.0 milligrams per 10 cubic meters. My experience in industry leads me to believe that this degree of exposure does not induce sufficient lead absorption to cause lead poisoning.

This conclusion is fully verified by the results obtained in the examination of 2 employees whose work has involved daily exposure to such lead as is regularly distributed into the atmosphere around the pot. Neither of the two workmen showed any clinical evidence of occupational lead absorption. Neither had a lead line, despite the presence of conditions in the mouth (pyorrhoea) which are favorable to the development of lead deposits in the gum tissue. Neither of them showed any blood changes (anemia or stippling) suggestive of lead absorption. Neither of them had abnormal quantities of lead in their blood and urine. [redacted] had 0.04 mg. Pb per liter of urine, and 0.03 mg. Pb per 100 grams of whole blood, while [redacted] had 0.03 mg. Pb per liter of urine and 0.035 mg. Pb per 100 grams of whole blood. These are quite within the limits of values found in perfectly normal persons with no occupational exposure to lead compounds.

I conclude, therefore, from the combination of these data, that the occupational conditions studied at this time are not such as to entail the risk of lead poisoning in workmen. It is also my opinion that the conditions described as in existence at the time of the plaintiff's employment, while probably involving somewhat greater exposure than that which occurs at present, were not sufficiently different in type or magnitude to justify an opinion that lead poisoning would have resulted from the exposure. Good clinical evidence would be required, therefore, to convince me that the plaintiff had lead poisoning at the time it was claimed that he had. By good clinical evidence I mean that characteristic symptoms, associated with lead line of the gums, perhaps, and certainly with excessive numbers of "stippled" red blood corpuscles, should have been present. The presence of abnormal quantities of lead in the urine or blood or in both at that time, would have been convincing, while the lack of such evidence is a serious fault in the plaintiff's claim. Returning to the subject of "stippled" erythrocytes (red blood corpuscles) it is necessary to demonstrate the presence of abnormal numbers before significance can be attached to the phenomenon. "Stippled" erythrocytes occur in the blood of normal persons up to ten or more per fifty microscopic fields, and they are found in increased numbers in a wide variety of conditions which have nothing whatever to do with lead absorption. Their presence, without reference to numbers, or without knowledge of other concomitant changes in the blood, is wholly without diagnostic significance.

Signed

Robert A. KEHOE

REPORT AND RECOMMENDATIONS ON CERTAIN CONDITIONS OBSERVED ANACONDA WIRE AND CABLE COMPANY at MARION, INDIANA.

Air samples were taken in the immediate vicinity of a melting pot in which scrap lead from cables was being melted. Detailed observations were made over a period of an hour and a half in order to note the conditions which were most favorable for the distribution of particulate lead compounds in the atmosphere. It so happened that the end of one shift and the beginning of another came during these observations. This period involved the removal of dross from the melting pot, an operation which occurs several times in each shift, and which involves much greater dissemination of dust than that associated with any other procedure. Air samples were taken from several points about the pot, at the height of the operator's face, during the period of normal operation. These samples were composited into Sample #1. Another series of samples, similarly combined as Sample#2 were obtained during the filling of the pot and during the removal of the dross.

The analysis of these samples yielded the following results:

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milligrams per 10 cubic meters are unsafe. Some workers give slightly lower values, in some instances as low as 1.5 milligrams per 10 cubic meters. The evidence, however, is very good in indicating that basic exposures as low as that involved in breathing air containing 2 milligrams of lead per 10 cubic meters, are substantially safe for all workers regardless of susceptibility factors.

On this basis of comparison the values observed in the vicinity of the pot may be regarded as indicative of a reasonable safety, in that the basic lead concentration has appeared to be in the neighborhood of 1 milligram per 10 cubic meters, while the brief periodic exposure, during drossing and shoveling is of the order of 2.5 to 3.0 milligrams per 10 cubic meters. My experience in industry leads me to believe that this degree of exposure does not induce sufficient lead absorption to cause lead poisoning.

This conclusion is verified by the results obtained in the examination of 2 employees whose work has involved daily exposure to such lead as is regularly distributed into the atmosphere around the pot. Neither of the two workmen showed any clinical evidence of occupational lead absorption. Neither had a lead line, despite the presence of conditions in the mouth (pyorrhoea) which are favorable to the development of lead deposits in the gum tissue. Neither of them showed any blood changes (anemia or stippling) suggestive of lead absorption. Neither of them had abnormal quantities of lead in their blood and urine. [redacted] had 0.04 mg. Pb per liter of urine, and 0.03 mg. Pb per 100 grams of whole blood, while [redacted] had 0.03 mg. Pb per liter of urine and 0.035 mg. Pb per 100 grams of whole blood. These are quite within the limits of values fouhd in normal persons with no occupational exposure to lead compounds.

Certain additional observations were made in the plant and on the two workmen which were not referred to in the preceding paragraphs.

Samples of the feces of the two men were obtained on the morning after a day of normal work. We have found that such samples give a good indication of the magnitude of the lead exposure. Unfortunately one of the two samples was too small to be useful but the other contained 1.46 mgm. lead, a quantity which is suggestive although inconclusive evidence of significant lead exposure.

A sample of dust was taken from the top of an electric switch or fuse box situated above a drinking fountain about 10 feet from the melting pot. This dust was seen to contain small bright globules of metallic lead, which evidently had been discharged from the melting pot. The analysis of this dust demonstrated the presence in it of 23.7% of lead. There was a considerable quantity of dust at this point, and it is believed that the analysis indicates the dessemination into the air of unnecessary quantities of metallic lead in finely divided form. Just what operation in the plant is responsible for this situation is not apparent, but the matter should be investigated.

On the basis of the combined observations, it is recommended that certain changes be made in the equipment and operating procedures.

(1). The fan which blows across the melting pot from the rear of the operator should be eliminated in order to avoid the distribution of dust into the air.

(2) The melting pot could with probable advantage be enclosed

on three sides in much the same fashion as a chemical fume hood.

(3). An extension of the ventilating duct should be extended to the area immediately overlying the pigging molds.

(4). The dross from the pot should be removed directly into a receptacle which is equipped with a tight-fitting top, instead of making use of an intermediate tray which subsequently must be emptied into a large collecting receptacle.

(5). Other sources of dust and fume should be sought out by means of periodic critical observation of all working operations. When such sources are noted, they should be corrected.

(6). Workmen on this job should be supplied with work clothes, and with double lockers. They should remove their clothing, put it in the clean locker and change to work clothes (kept in the other locker). At the end of the shift, they should reverse the process, bathing before resuming their clean clothing.

(7). Quite in addition to the advantages of greater safety to the workmen, experience has shown that pre-employment and periodic examination of workmen in hazardous trades, or in trades which are generally assumed to be hazardous, provides a considerable security to the employer against mistaken or fraudulent claims of occupational injury or illness. Such examinations should be carried out with precision. If done properly they will prove useful for the recognition of hazardous exposure. The advantages of such information are considerable in view of the frequency with which operating changes occur in manufacturing plants.

When vague or uncertain types of illness appear among workmen, it is advisable, from every point of view, to make complete clinical studies and to arrive at diagnoses which can, if necessary,

be substantiated in court. The type of medical service which will accomplish this purpose, will deserve the confidence of workmen and will prevent difficulties like the case recently at issue, while at the same time, it will inform plant management as to the status of such occupational hazards as arise from the operation of a plant. Such medical supervision is recommended, at least, in the case of men engaged in work which involves potential exposure to toxic materials. Any assistance or advice which will be instrumental in bringing about such an hygienic program will gladly be given.

Signed: _____

Director
Kettering Laboratory of
Applied Physiology
University of Cincinnati