

or allow to settle and decant the clear solution, and finally add the boric acid.

In so far as anode corrosion is concerned, any soluble chloride might be substituted for the nickel chloride, but not without some effect on the character of the deposit. Magnesium chloride or sodium chloride seems to be preferred for this purpose. In case either of these is used, neutralizing might well be done by the carbonate of the same metal. Ammonium salts and the "double sulphate" of nickel are to be avoided, since they are likely to cause crystallization from solution when cold.

To obtain the best results from a hot solution the current density must be high; cables and tank rods must therefore be of ample capacity. Control of a hot solution by regulation of the amount of anode surface will probably be easier than in a cold bath. The heating coil

should be of heavy lead (or hard lead) pipe, with a settling space of five or six inches below the lowest coil; lead will also serve as a lining for the tank. If an electric cleaner is operated from the plating dynamo, either the heating coil should be electrically insulated, or all rheostats should be connected on the cathode side of the line. Should gas pitting occur on first using the solution in the morning, it may be avoided by heating the bath to boiling for a few minutes before beginning plating. Seventy deg. Cent. (158 deg. Fahr.) is a good temperature at which to operate a hot nickel bath.

Owing to the peculiar properties of electrolytic nickel, the advantages of a hot over a cold solution are greater in nickel plating than in the deposition of any other metal.

ADVANTAGES OF A HOT OVER A COLD NICKEL SOLUTION.

1. Heating from 25 to 70 deg. Cent. (79 to 158 deg.

Fahr.) lessens the resistance of the solution by one half.

2. The current density may be increased two and a half to three fold.

3. The current efficiency, if less than 100 per cent in the cold solution, is raised.

4. Anode corrosion is greatly improved, and higher current densities may be used at the anode as well as at the cathode.

5. The deposit is superior to ordinary nickel plate in toughness and freedom from peeling.

6. In the solution tested, plating may be done at 200 to 300 amperes per square foot (22 to 33 per square decimeter), at which rate the same amount of metal is deposited in five minutes as requires one and a half hours in the "rapid solutions" now in use at ten amperes per square foot.

Nightblindness*

By Dr. M. Meyerhof

A NUMBER of observations of nightblindness have been published during the present war which were made on soldiers in the field. The impossibility to find their way at night brought the men thus afflicted soon under medical treatment. Braunschweig¹ has in a short time had occasion to examine 27 such cases among widely different parts of the army; Zade² 12, Best³ 36, and Paul⁴ 16. All of these cases were seen at the scene of the war during the trench fights and especially in winter. Aside from errors of refraction, the eyes never showed any symptoms of disease; malnutrition was in most cases not to be thought of. Bitot's spots on the bulbar conjunctiva were always absent. A number of wounded officers with whom I had occasion to speak, affirmed that they had seen here and there cases of nightblindness among their men. All of these cases had occurred in the trenches and especially during the winter of 1914 to 1915. The moving war in the East, though fraught with much greater bodily strains and an often poor food supply on account of the bad roads and the rapid advance, seems to have brought about such cases of nightblindness but rarely. (Compare Uhthoff.)

It may be of interest to relate similar observations from the literature of the Napoleonic wars, although it is not possible to make at this late date a correct diagnosis.

When Bonaparte moved in 1798 with his just landed army from Alexandria to Cairo, his soldiers quite naturally suffered terribly from heat, thirst, sun blinding, and—in consequence of lack of foresight as regarded the poor supplies of the Nile land—from hunger. To this was added the tiring, severe service on night watches against the opposing bedouins and fellahin who sneaked forward without making a noise, so that, for instance, early on July 5th a severe night battle took place in the divisions of General Bon. On July 16th, four days previous to the battle at the pyramids, Detroye,⁵ chief of a battalion of engineers, wrote in his unpublished diary: "A number of soldiers have been attacked by an eye affection and cannot see by night." Since the serious inflammation of the eye, which later on ravaged the French army in such a terrible manner, began only in August, these were probably isolated cases of nightblindness. However, neither the chief surgeon Larrey,⁶ nor the physician in chief Desgenettes⁷ mentioned any such cases. It must be remembered that nightblindness is found even to-day epidemically among the badly nourished fellahin, especially the children, and particularly in certain regions of the Nile delta in which pellagra, too, is not rare on account of living on bad maize. I have not been able to find any other mention of nightblindness in any of the numerous writings on the campaigns, so full of deprivations, made by the French or English in Egypt and Syria.

On the other hand, Robert,⁸ physician in chief of the military hospitals during the siege of Malta (1798 to 1800) gives a more accurate description of nightblindness which raged epidemically among the shut-in French troops.⁹ In October, 1798, the blockade was completed by the English fleet. At the end of December scurvy

was already rampant, so that in February, 1799, over 400, and in April 636, men suffered from it. Most of these patients complained at the same time of nightblindness. "The nyctalopia (sic)," says Robert, "is that form of eye disease in which patients cannot see at night. It is easy to recognize such patients; their pupils are large and considerably dilated. At night they cannot at all differentiate between objects. This disease attacks most frequently cachectic individuals with flabby tissues. . . . During the winter of 1798-99 (year VII.) this disease was epidemic at Malta. The soldiers of Forts St. Angelo and St. Elmo suffered especially from it, while those of Fort La Florina remained perfectly free from it. The first named forts lie in the lowest part of the city, at the seashore, while the Florina lies highest and near the country. Cold, moisture and night chills, together with insufficient food, are, therefore, the distant causes of nyctalopia; I especially mention the poor food, because the first cause alone could not have produced the nightblindness. There are frequent cold and moist winters at Malta and, yet, nightblindness had not occurred before. . . . At the same time when this nyctalopia appeared many individuals were attacked by diarrhoeas or colds, others by discharges from and tearing of the eyes; those suffering in this way did not show nightblindness to the same extent. . . . The immediate cause of this disease is, therefore, an atonic condition, tiring and diminution of sensitiveness of the visual organ. Although the prognosis of this disease was free from any danger, still it caused considerable anxiety. Those afflicted by it could not stand guard on the walls of the forts by night. Fumigations of animals' livers and aromatic plants cured the disease. It reappeared, however, after a short time. During the whole time of the winter, as long as the conditions underlying it continued, it could not be cured; as soon, however, as the conditions of the soldier could be improved, and as soon as the cold and moisture had given way to the agreeable warmth of spring, the sensitiveness of the visual function returned and the disease disappeared." Soon thereafter the scurvy, also, disappeared by which 300 men had been affected. Although the siege lasted till September, 1800, that means through a second winter, Robert does not mention this disease any more.

This was probably a real epidemic nightblindness, as it used formerly to be quite frequent (mostly combined with xerosis conjunctivæ) in prisons, schools and among ships' crews¹⁰ in consequence of the lack of green vegetables. Yet, it was not observed during other prolonged sieges in the 19th century (for instance at Hamburg, Sebastopol, Paris); as also at Port Arthur in 1904 and Przemyśl, 1914-1915.¹¹ It is notable that the nightblindness at Malta diminished when spring came and even disappeared. Braunschweig and Paul, too, saw their cases during winter. If exhaustion and under-nutrition are to be accused, such reports of nightblindness should surely have been expected in the communications concerning the French campaign in Russia in 1812. There are, however, none from the relations of individuals who took part in that campaign and none in the medical description of the Belgian military surgeon Von Kerckhove.¹² He mentions only a slight epidemic infection of the eyes at the beginning of the

campaign and severe ophthalmia during the retreat, a purulent discharge, which often led to blindness and was later on transmitted to the Prussian troops. Once (p. 168) he says, that many soldiers suffered from weakness of vision, even blindness, which was looked upon as "exhaustion of the irritability of the retina on account of the blinding snow." This was with probability in reality rather snowblindness than nightblindness. Larrey says occasionally (*Clinique Chirurgicale, exercée particulièrement dans les camps et les hôpitaux militaires*, etc. T. V. Paris, 1836) that during the Russian campaign of 1812 blindness from amaurosis (gutta serena) occurred quite frequently.

Uhthoff¹³ has recently stated that during the campaign in Russia in 1914-1915 he has seen few cases of nightblindness, in spite of exhaustion and deprivations.

From all these communications it is impossible to get a definite knowledge of these cases of nightblindness, developed in the field. In the two cases which thus far I have observed it was caused by corneal opacities and astigmatism. On the other hand, I know from a reserve battalion that it has among its men several with congenital, probably hereditary, nightblindness who on account of this defect are unfit for guard and field duty. The hereditary nightblindness in the French family Nougaret was indeed detected by Cunier in 1838, because a soldier of this family had been found inattentive on guard duty, and had been wrongly punished. We must, therefore, assume with Best that there is no uniform cause for the cases of nightblindness, which have been observed in this war. A careful distinction of the cases according to his method and the observation of their curability will greatly improve our knowledge of this as yet enigmatical disease.

While these remarks were written, a paper by H. Feilchenfeld appeared, who has seen nightblindness, usually among miners, only associated with nystagmus and in diseases of the fundus. Sometimes it was simulated to escape work.

Professor Hirschberg drew my attention to the fact that in his book on "Aegypten" (Leipzig, 1890, p. 100), he has mentioned a report of the crusades which bears on our subject. It refers to the unhappy campaign of Johann von Brienne into Egypt and the capitulation of the crusaders at Damiette in 1221 A. D., related by Oliverius Scholasticus in *Historia Damiatina* (Eccard, *Corpus historæ mediæ ævi* II, 1414): "Ex angustia famis diversa morborum genera vexabant eos et inter cetera incommoda quae sustinuerunt noctibus velut arisia (arasia) percussis apertis oculis nihil videre dicebantur." Hirschberg adds that this was evidently nightblindness from lack of nutrition, and explains in a footnote the word arasia as blindness as it is used in the septuaginta translation of the Bible.

Water Power in the United States

REVISED figures of the potential water power resources of the country place them, says the report, at the minimum of 27,943,000 horse-power and the maximum of 53,905,000, the minimum representing the amount of power that could be developed from the use of the average annual minimum stream flow for the lowest two consecutive seven-day periods of each year, while the maximum represents the amount that could be developed from the use of the average maximum continuous stream flow available for six months during the year. The national forests are stated to contain 30.4 per cent of this minimum and 31.3 per cent of the maximum, while over 72 per cent of the country's total is found in the Mountain and Pacific States and 42 per cent in the three Pacific Coast States. National forest water power amounts to 42 per cent of the minimum and 43 per cent of the maximum estimated power resources of the Western States.—*Report of the United States Department of Agriculture.*

¹³Sitzung der Med. Section der Schles. Ges. f. vaterl. Kultur, Nov. 19th, 1915; *Med. Klinik*, 1915, p. 1361.

**Centrbl. f. Prakt. Augenblk.*, Jan., Feb., 1916.

¹Braunschweig. Kurze Mittheilung ueber die epidemische Hemeralopie im Felde. *Muench. med. Wochenschr.*, 1915, No. 9, p. 303.

²Zade. Ueber Augenerkrankungen im Felde. *Ibidem*, No. 23, S. 800.

³Best. Ueber Nachtblindheit im Felde. *Ibidem*, No. 33, p. 1121.

⁴Paul. Beobachtungen ueber Nachtblindheit im Felde. *Ibidem*, No. 45, p. 1548.

⁵Cited by De la Jonquière, *L'Expedition d'Egypte*, 1798 to 1801.

⁶J. Larrey. Relations historique et chirurgicale de l'expédition de l'Armée d'Orient. Paris, A. XI, 1803.

⁷R. Desgenettes. Histoire médicale de l'Armée d'Orient. An. X, 1802.

⁸Robert. Mémoire sur la topographie physique et médicale de Malte. An XI, 1803.

⁹Robert gives a special chapter to nightblindness, entitled "nyctalopia," while he had previously called the same affection "héméralopie," which is the usual term nowadays. For the Hippokraties a nyctalops is a day blind; for Galen and the later authors the night blind.

¹⁰Fr. Tyrrell (*A Practical Work on the Diseases of the Eye*, vol. II, London, 1840), relates that it was particularly frequent on English ships in the ports of the East and West Indies and was called moonblindness by the sailors.

¹¹The Regimental Physician, Dr. R. Pamperl (*Mediz. Klinik*, 1915), says that scurvy, too, appeared only after the end of the siege among Austrian prisoners in the hospitals.

¹²Histoire des maladies observées à la Grande Armée française, pendant les campagnes de Russie en 1812 et d'Allemagne en 1813. Par le chevalier J. R. L. de Kerckhove dit de Kirchoff. Troisième édition. Anvers, 1836.