An Investigation of N-Rays.

R. R. Ramsey and W. P. Haseman.

This paper is an account of an attempt of the authors to repeat the experiments of R. Blondlot in which he has discovered that there is an invisible radiation given off from an Auer (Welsbach) burner, Nernst lamp and other sources.

Blondlot was investigating the polarization of X-rays (Comptes Rendus, Feb. 23, 1903) and using a feeble spark gap as a detector. He thought he had discovered that the X-rays were polarized in certain planes. In a few days (Comptes Rendus, March 23, 1903) he was convinced that the effects were due to other rays than X-rays. In May of the same year (Comptes Rendus, May 11, 1903) an article by Blondlot appeared, entitled, "Rays from an Auer Burner." An ordinary Welsbach burner (Auer burner) was surrounded with an iron chimney in which a window was cut and closed with an aluminum sheet .1 mm. thick. The radiation from this window was allowed to fall on the little spark gap and the intensity of the light from the spark was seen to increase. By means of a quartz lens Blondlot was able to detect four different wave lengths. The intensity of the spark gap is found to have four maximums as it is moved to and fro along the principal axis of the lens.

A week later (Comptes Rendus, May 25, 1903) Blondlot published an article in which he gave a list of various sources of N-rays and several means of detecting them, the chief ways being the little spark gap; a sheet of silver heated to a very dull redness by a little gas flame; a small phosphorescent screen which has been feebly excited by sunlight or other source.

The intensity or brilliancy of these detectors was found to increase when the radiation falls upon them. In this article Blondlot calls the new rays N-rays, from the town of Nancy, his home.

In a short time afterward Blondlot published an article in which he found that a Nernst lamp with an aluminum window is a good source. He also found that certain substances store up N-rays when they are exposed to N-rays and give off the rays afterward. Among those that store up the rays are quartz, stones and brick. Wood, aluminum, paper, dry or wet, and paraffin do not store up the rays. He found that one of the essential conditions of a substance that stores up the rays is dryness. It is found that bricks exposed to sunlight become a source for hours afterward.

While experimenting along this line Blondlot discovered an unexpected effect. While viewing a strip of white paper which was feebly illuminated, a brick which had been exposed to sunlight was brought near the eye and the outline of the paper became more distinct. The intensity diminished when the brick was removed. A clock face which seemed a grey patch on the wall became clearly outlined and the hands visible when a brick was brought near the eye. Water intercepts the radiation, in fact, Blondlot used dampened paper as screens in his work. Salt water transmits the rays. An ox eye was transparent and became a secondary source. Hyposulphite of soda in solid or solution is found to be a powerful accumulator. Blondlot has found that compressed glass, wood, etc., emit N-rays and cause the phosphorescent screen to become more luminous. A bent cane near the head caused a clock to become more visible. Unbending the cane caused the clock to disappear. Tempered objects, such as files, knife blades, hammered brass, had the same effect, as also did a knife blade from an ancient tomb. The rays are emitted from nearly every strained object. In fact F. E. Hackett (Roy. Dublin Soc. Trans. 8, 10, pp. 127-138, Sept. 1904), the only English speaking person who is sure he has observed the effect, recommends the use of cork or wood under pressure as a source.

In the early part of the present year Blondlot finds that he has been dealing with two distinct kinds of radiation. N-rays cause the calcium sulphide screen to become more luminous, while the second radiation, or N_1-rays cause the normal intensity to decrease. N-rays cause the normal intensity from the screen to increase, while N_1-rays cause the tangential radiation of the screen to become more luminous.

Photographs have been published which show a greater effect on the plate under the influence of the N-rays than that without. For these photographs, in every case, the light from the little spark gap is used. A. Charpentier has found that the human body is a source of N-rays, the intensity being greater near the nerve centers. The spinal column can be traced by means of the screen. Certain parts of the brain give off the rays abundantly. The intensity being greatly augmented when the brain is active. Charpentier can see himself think. To refute those who say the phenomenon is one of heat Charpentier has placed frogs on ice and lowered their temperature below that of the screen and shown that the cold frog is still a source.

Charpentier describes experiments in which N-rays are conducted along wire. Two phosphorescent screens are attached on the ends of a wire, length in one case 300 cm. N radiation is allowed to fall on one screen and the screen on the other end is seen to become more luminous. The N-rays are found by Charpentier to have the property of increasing the intensity of certain odors: ammonia, acetic acid, etc.

E. Meyer has found that plants emit N-rays. Certain substances while going into solution become sources. The electrolyte of a Le Clanche cell has been found to be a strong source after the cell has been short-circuited.

One curious fact about N-rays is that up to very recently at least, every successful experimenter has been a Frenchman.

Numerous short articles have appeared explaining the phenomena as one of heat or as one due to psychical phenomena.

Although we so far, like many others, have not been successful, we thought an account of our attempts was worthy of mention.

It was evident after a number of preliminary trials that the eye could not be relied upon to detect the variation in a feebly luminous source of light. The rays are produced by a Welsbach burner shut up in an iron pipe about 50 cm. long, 10 cm. in diameter with walls 1 cm. thick. The pipe is pierced by a window about 5 cm. long and 2 cm. in width

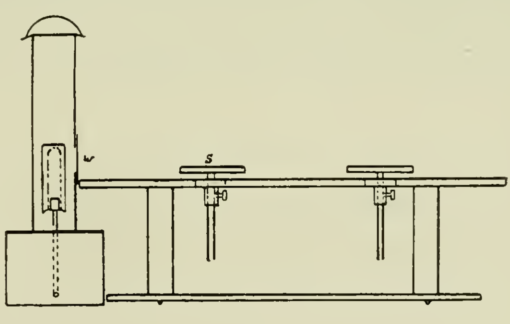


FIG. 1

and closed by some black paper, and a sheet of aluminum 16 mm. thick. The general arrangement of the apparatus is that shown in Fig. I. The rays are supposed to pass through the window W and fall on some feebly luminous object such as a heated platinum wire or a calcium sulphide screen at S. Both the platinum wire and the sulphide screen were used and when viewed by the eye through ground glass at various angles and positions relative to the source nothing definite was noticed. The feebly luminous spot at times apparently brightened, then moved around in a circle and went through a series of displacements. This proved that nothing definite can be arrived at by viewing directly with the eye.

The most reliable method of recording the action of a feebly luminous source is photography. With this method, direct and indirect vision is eliminated, as well as the error due to the increased sensitiveness of the eye after being in the dark for some time. A number of photographs were taken, on Seed's regular "gilt edge" plates, with the light from a heated platinum wire, a luminous calcium sulphide screen, and a feeble spark.

The Platinum Wire.

The platinum wire was a very thin strip cut from a piece of foil .03 mm. thick, so that in no place was the wire more than .05 mm. broad. Only one place along it was allowed to be heated and the approximate breadth of this place was .03 mm. The wire was heated by a current approximately .9 amperes from three or five Edison-Lalande batteries. In some of the latter experiments a storage battery was used. The relative position of the different parts of the apparatus is shown in Fig. II.

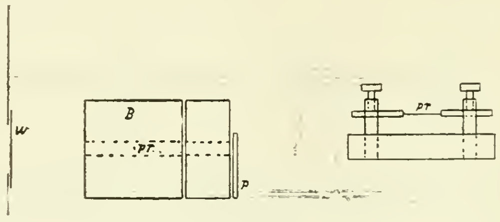


FIG. II.

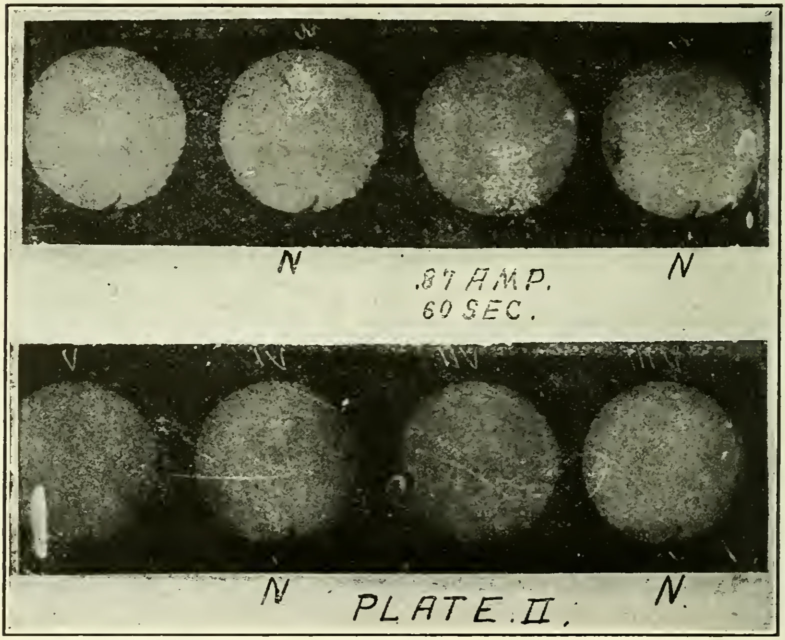
B is a cardboard box in which is placed the platinum wire. The platinum wire is soldered to two copper wires which are fastened to a wooden block by two binding posts in order to make connection with the battery. The photographic plate was so mounted back of a block of wood about 25 cm. long, 14 cm. wide and 4 cm. thick with a hole 2½ cm. in diameter that it could be slid past the opening and a number of exposures made upon one plate.

PLATE. I.

The first two photographs taken with the apparatus just described with the time of exposure and current as indicated. There is very little if any difference between those marked N and the others. Those marked N are exposures without a lead screen inserted between the source and the platinum wire.

Calcium Sulphide.

The calcium sulphide is the luminous sulphide as prepared by E. H. Sargent & Company, Chemists, of Chicago. The sulphide was spread on a cardboard with mucilage and excited by sunlight. A tin can was placed around the iron pipe and aluminum window placed in the tin can. With this arrangement some of the external heating effects were eliminated.



Photographs III and IV were taken with the sulphide screen parallel to the aluminum window so that the rays must fall on the back side of the screen while their effect was photographed from the front side. Photograph III was taken with the sensitive plate about 4 cm. from the screen while IV was less than 1 cm. and in no case was the sulphide screen more than 25 cm. from the source. In III the exposures were alternated so that 2, 4, 6 and 8 were exposed to all radiations that might come from a Welsbach burner and pass through an aluminum window, while 1, 3, 5 and 7 were taken when a lead screen was placed

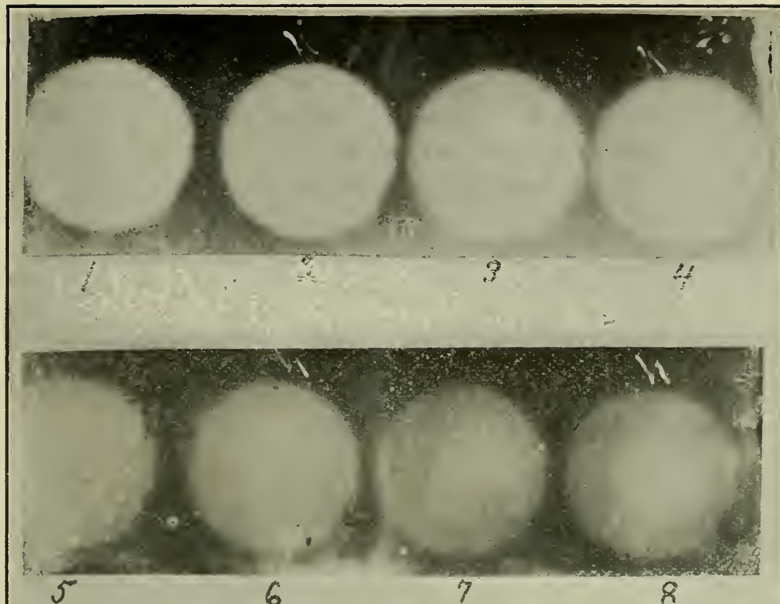


PLATE. III.

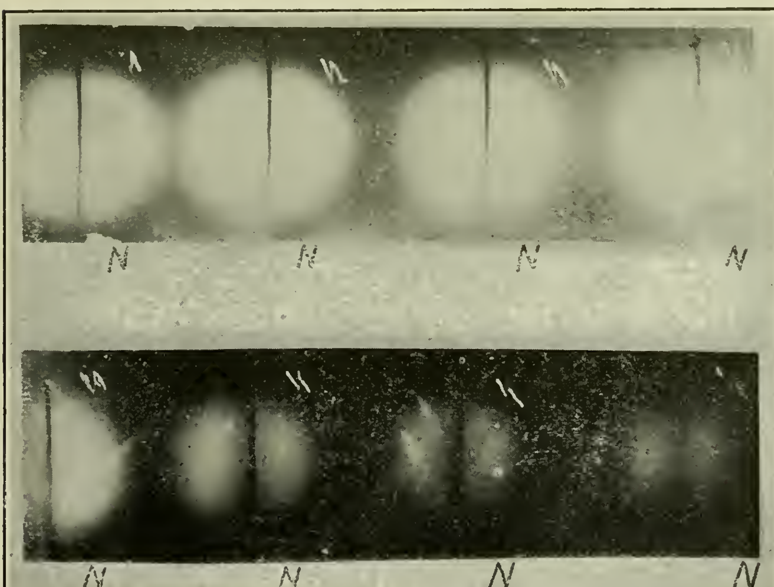


PLATE. IV.

between the source and sulphide screen. In the photographs it is seen that there is a gradual decay in the luminous intensity of the screen, and if there is any radiation coming from the burner, in no case is it sufficently intense to overcome the decay or even make the rate noticeably different.

Photograph IV was taken by exposing one-half of the luminous screen to the radiations while at the same time the other half, which was screened from them by lead, was exposed. The arrangement is similar to that shown in Fig. III.

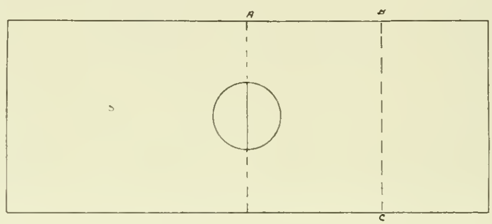


FIG. III

S is a large lead plate 1 mm. thick with a circular opening in the center, on the back of which is fastened the sulphide screen. In the line A D across the opening is a lead strip projecting 2 or 3 mm. foward. A B C D is a small lead plate on the back side of the larger one, covering one-half of the opening. With this arrangement sixteen exposures were taken on one plate and a direct comparison can be made. In the sixteenth

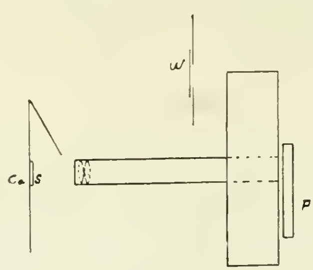
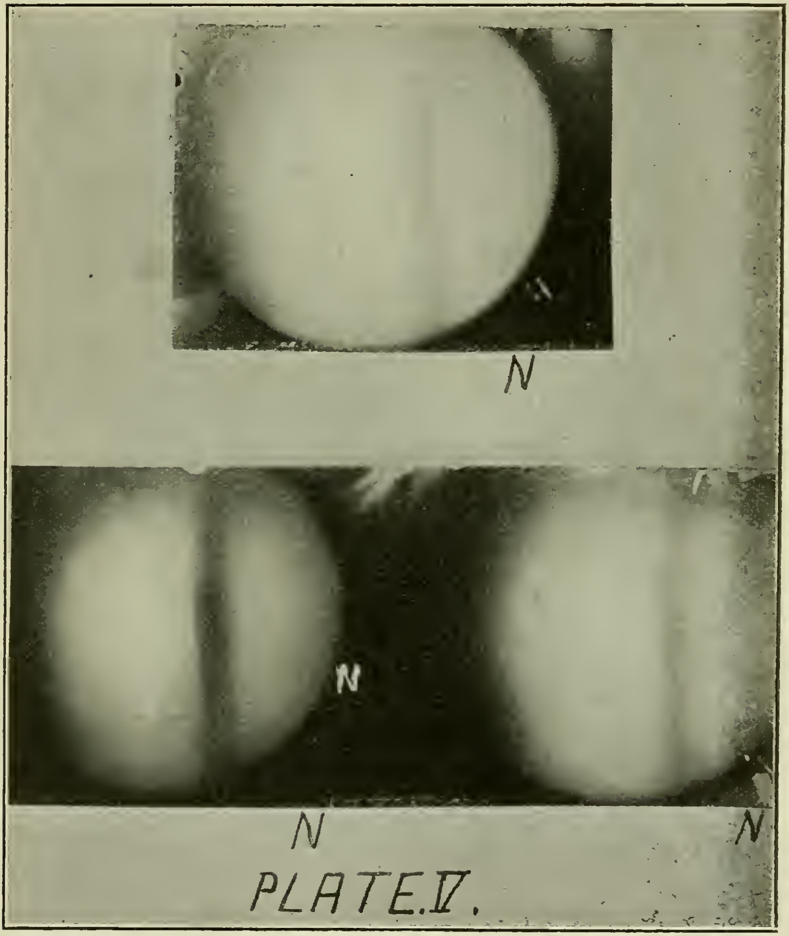


FIG. IV.

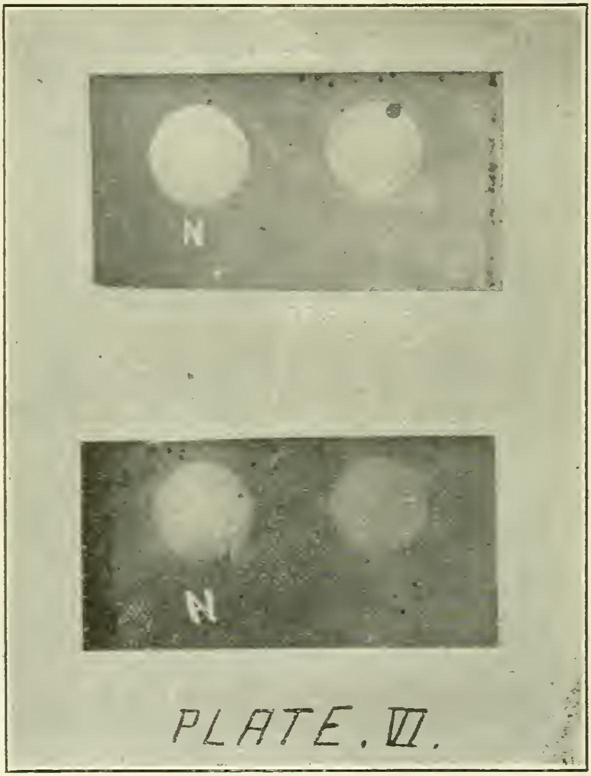
there is not much difference between the half marked N and the half not marked at all.

Photograph V is taken with the aid of convex lenses, focussing the light from the sulphide screen on the plate; by means of a lead plate,



one-half of the luminous screen was screened from the source in such a manner as is shown in Fig. IV. A black strip of paper is pasted across the center of the screen to mark the halves of the luminous sulphide.

Photograph VI is a trial plate to investigate the effect of various times of exposures. The exposures marked N are seen to be slightly darker on the negative. This seems to indicate that there is a slight effect from the radiations of the Welsbach burner. Photographs VII and VIII



are to show whether or not VI is due to a radiation. VII shows similar results to VI and is taken under similar conditions. It was thought that it might be due to heat, and to prove this a lead plate was placed against the tin can, where it became heated. Exposure VIII is made with the radiation cut off by the lead plate suspended between the source and sulphide screen and shows similar results to VI and VII. The exposures marked N are the denser on the negative, not because of a radiation falling on the corresponding side of the screen, but because of heat or of initial conditions of luminosity. The arrangement of apparatus for these three photographs is shown in Fig. V.

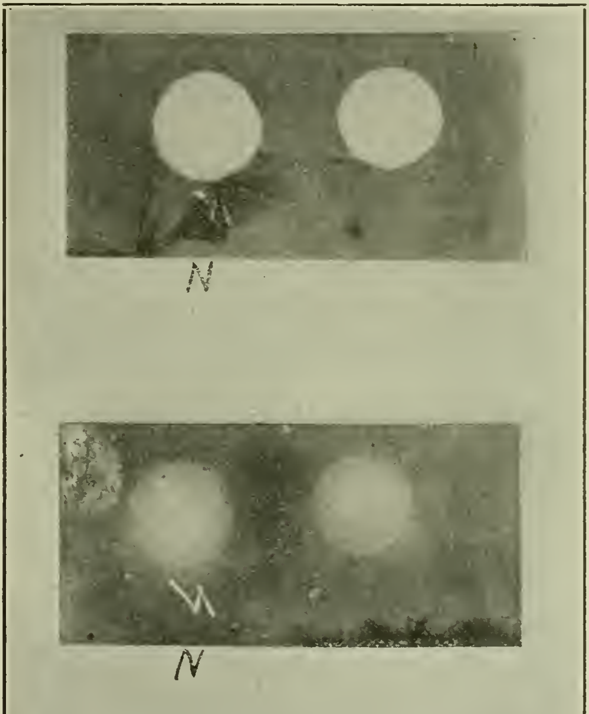
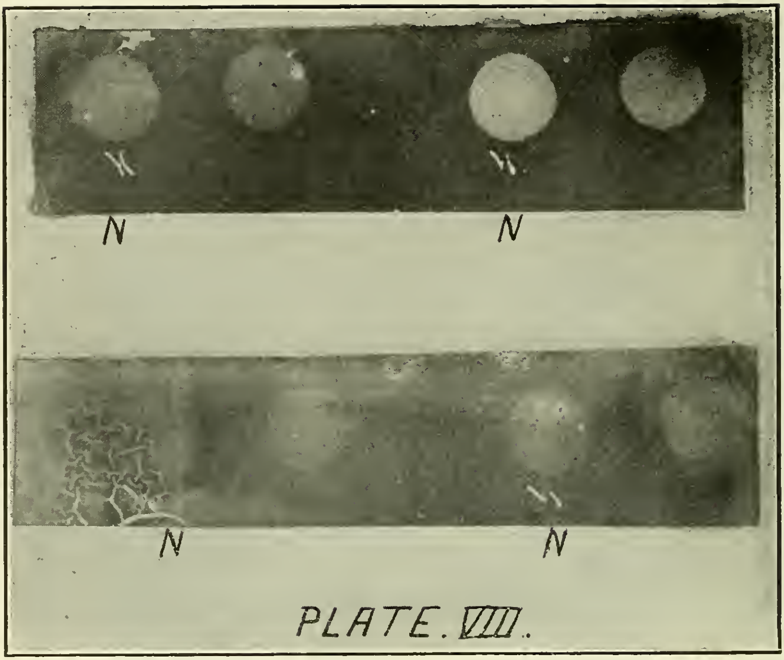


PLATE. VII.



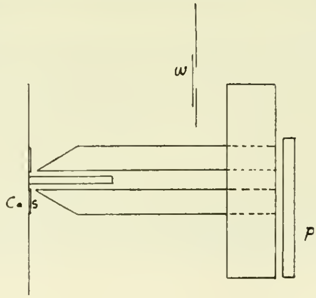
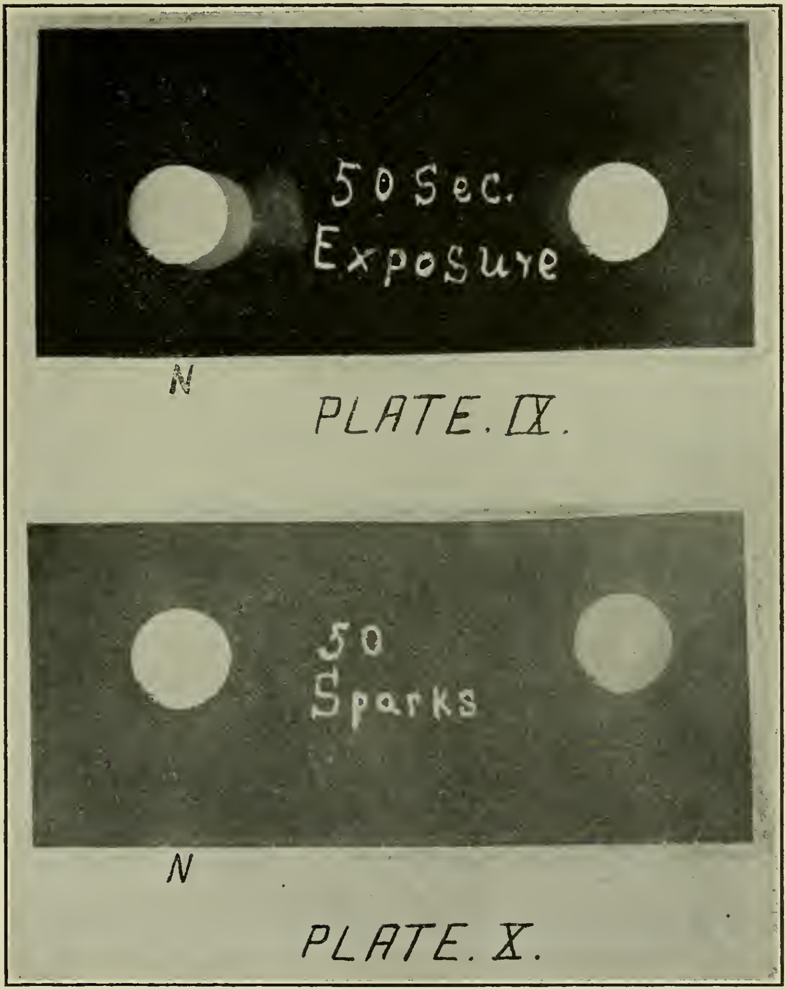


FIG. V.

FEEBLE SPARK.

The apparatus used was as described in Blondlot's work. The results were negative and only two photographs taken, both of which are given in plate IX and X. The intensity of the spark was that given by a spark between two rounded ends of platinum wire ½ mm. diameter separated a small fraction of a mm. The potential at the spark gap was not



great enough to spark a distance of ¼ mm. While working with this apparatus a phenomenon occurred which shows how easily constant errors may influence the result. The lead screen used to intercept the radiation was suspended by cords to the top of the iron lamp chimney so as to be easily and noiselessly swung in and out of the path of the radiation from the window. It was noticed that when the lead was interposed the intensity of the spark gap as seen through the ground glass diminished considerably and increased again when taken away. This was what we were looking for. Of course we thought that after weeks of vain effort we were to be rewarded. After changing our apparatus a little the results were just the reverse of what we expected. We also noticed the character of the sound of the vibrator of the induction coil changed in unison with the intensity. A little investigation showed that a slight pressure anywhere on the table would produce the same effect. It seemed that the vibrator was vibrating about a point of nearly unstable equilibrium. A slight change of level of the table caused the vibration to be different and thus cause a different intensity of the spark. The weight of the screen as it was swung to and fro was enough to change the level of the table, which was an ordinary wooden one set solidly on a concrete basement floor.

A three-glower 220 volt Nernst lamp was substituted for the Welsbach lamp. The results were the same as before.

Our results are all negative. After experimenting for some months and appreciating the difficulties and the various psychial phenomena that may enter we are tempted to believe, as some others do, that the various French physicists have been misled. On the other hand, when we consider that the experimenters on this phenomenon have world-wide reputation, we can not think that such men as Blondlot, Charpentier, or Becquerel would rush into print on a subject of which they were not absolutely certain, especially on one that has been called in question by noted physicists.

It is our intention to remodel our apparatus in certain respects and continue the investigation.

Bibliography N-Rays.

R. Blondlot.

New Light.

Comptes Rendus 136, pp. 735-738, March 26, 1903.

Journal de Physique, Vol. II, p. 339. 1903.

Rays from an Auer Burner.

C. R. 136, pp. 1120-1123, May 11, 1903.

Journal de Physique, Vol. II, p. 481. 1903.

Blondlot's N-rays.

C. R. 136, pp. 1227-1229, May 25, 1903.

Journal de Physique, Vol. II, p. 549. 1903.

N-rays in Solar Radition.

C. R. 136, pp. 1421-1422, June 15, 1903.

Journal de Physique, Vol. II, p. 551. 1903.

Action of N-rays.

C. R. 137, pp. 166-169, July 20, 1903.

New Effect of N-rays.

C. R. 137, pp. 684-686, Nov. 2, 1903.

Storage of N-rays by Certain Bodies.

C. R. 137, pp. 729-731, Nov. 9, 1903.

Effect of N-rays on the Eye.

C. R. 137, pp. 831-833, Nov. 23, 1903.

Emission of N-rays by Constrained Bodies.

C. R. 137, pp. 962-964, Dec. 7, 1903.

Dispersion and Wave-length of N-rays.

C. R. 138, pp. 125-129, Jan. 18, 1904.

Action of N-rays Recorded by Photography.

C. R. 138, pp. 453-456, Feb. 22, 1904.

New Kind of N-rays.

C. R. 138, pp. 545-547, Feb. 29, 1904.

Peculiarities of the Action of N-rays.

C. R. 138, pp. 547-548, Feb. 29, 1904.

Blondlot's N-rays.

Electrician 52, p. 830, March 11, 1904.

Difference in the Action of Heat and of N-rays on Phosphorescence.

C. R. 138, p. 665, March 14, 1904.

Action of N-rays.

C. R. 138, pp. 1394-1395, June 6, 1904.

Photographic Registration of N-ray Effects.

C. R. 138, pp. 1675-1676, June 17, 1904.

Heavy Eminations.

C. R. 138, pp. 1473-1476, June 13; pp. 1676-1679, and C. R. 139, pp. 22-23, July 4, 1904.

New Method for Observing N-rays.

C. R. 139, pp. 114-115, July 11, 1904.

A. Charpentier.

Emission of N-rays by the Human Body.

C. R. 137, pp. 1049-1051, Dec. 14, 1903.

N-rays of Physiological Origin.

C. R. 137, pp. 1277-1280, Dec. 28, 1903.

Physiological Radiations.

C. R. 138, pp. 45-46, Jan. 4, 1904.

Transmission of Physiological Radiation Through Wires.

C. R. 138, pp. 194-196, Jan. 25, 1904.

Physiological Action of N-rays.

C. R. 138, pp. 270-272, Feb. 1, 1904.

Tranmission of N-rays.

C. R. 138, pp. 414-416, Feb. 15, 1904.

Action of the N-rays on the Olfactory Organs, and Emission of N-rays by Oderiferous Substances.

C. R. 138, pp. 584-586, Feb. 29, 1904.

Action of the N-rays on the Auditory Sensitiveness.

C. R. 138, p. 648, March 7, 1904.

Physiological Action of Blondlot's N_1-rays.

C. R. 138, pp. 648-649, March 7, 1904.

Generation, Through the Nerves, of the Action of N-rays Applied at Any Point of the Body.

C. R. 138, pp. 715-717, March 14, 1904.

Selective Physiological Action on Phosphorescent Screens.

C. R. 138, pp. 771-774, March 21, 1904.

Physiological Action on Phosphorescence.

C. R. 138, pp. 919-920, April 11, 1904.

Nervous Oscillations and Their Propagation Studied by the N-rays Emitted by the Nerves.

C. R. 138, pp. 1121-1123, May 9, 1904.

Relation Between Organs of Perception and the Physical Agents Acting Upon Them.

C. R. 138, pp. 1282-1283, May 24, 1904.

Emission of N-rays After Death.

C. R. 138, pp. 1351-1352, May 30, 1904.

Resonance Method for Determining the Frequency of Nervous Oscillations.

C. R. 138, pp. 1723-1725, June 27, 1904.

Stationary Waves Observed in the Neighborhood of the Human Body.
C. R. 139, pp. 155-157, July 11, 1904.

A. Charpentier and E. Meyer.
Emission of N_1-rays in Certain Inhibitory Phenomena.
C. R. 138, pp. 520-521, Feb. 22, 1904.
Emission of N-rays in Inhibitory Phenomena.
C. R. 138, pp. 832-833, March 28, 1904.

E. Meyer.
Emission of N-rays by Vegetables.
C. R. 138, pp. 101-102, Jan. 11, 1904.
Emission of N-rays by Plants.
C. R. 138, pp. 272-273, Feb. 1, 1904.

M. Lambert and E. Meyer.
Action of N-rays on Biological Phenomena.
C. R. 138, pp. 1284-1285, May 24, 1904.

E. Bichat.
Transmission of N-rays.
C. R. 138, pp. 329-331, Feb. 8, 1904.
Transparency of N-rays.
C. R. 138, pp. 548-550, Feb. 29, 1904.
Particular Cases of Emission of N-rays.
C. R. 138, pp. 550-551, Feb. 29, 1904.
New Observations with a Phosphorescent Screen.
C. R. 138, pp. 1254-1257, May 24, 1904.
Phenomenon Analogous to Phosphorescence Produced by N-rays.
C. R. 138, pp. 1316-1318, May 30, 1904.
Emission of N-rays by Crystalline Bodies.
C. R. 138, pp. 1396-1397, June 6, 1904.
Perpendicular Emission of N- and N_1-rays.
C. R. 138, pp. 1395-1396, June 6, 1904.
Variations of Luminosity of Phosphorescent Sulphide Under Action of N-rays.
C. R. 139, pp. 254-256, July 25, 1904.

P. Jégon.
N-rays Emitted by a Current in a Wire.
C. R. 138, p. 491, Feb. 22, 1904.

H. Bagard.
Natural Rotary Power of Certain Substances for N-rays.
C. R. 138, pp. 686-688, March 14, 1904.

G. Sagnac.

Wave-length of N-rays Determined by Diffraction.

C. R. 137, pp. 1435-1437, June 15, 1903.

J. M. de Lepinay.

Production of N-rays by Sonorous Vibrations.

C. R. 138, pp. 77-79, Jan. 11, 1904.

Objective Action of N-rays.

C. R. 138, pp. 798-799, March 28, 1904.

A. Colson.

Application of Blondlot Rays to Chemistry.

C. R. 138, pp. 902-904, April 11, 1904, and

C. R. 138, pp. 1423-1425, June 6, 1904.

Origin of the Blondlot Rays Emitted During Chemical Reaction.

C. R. 138, pp. 1098-1099, May 2, 1904.

G. Ballet.

Emission of N- in Certain Pathological Conditions.

C. R. 138, pp. 524-526, Feb. 22, 1904.

J. Meyer.

Penetrating Power and Storage of N_1-rays.

C. R. 138, pp. 896-897, April 11, 1904.

Action of Anaesthetics on the Sources of N-rays.

C. R. 138, pp. 1335-1337, May 30, 1904.

Action of Sources of N-rays on Pure Water.

C. R. 138, pp. 1491-1492, June 13, 1904.

The Human Body and Blondlot's Heavy Emanation.

C. R. 139, pp. 320-322, July 25, 1904.

P. L. Mercanton and C. Radzikowski.

Action of N-rays on the Isolated Nerve Trunk.

C. R. 139, pp. 1541-1542, June 13, 1904.

C. Gutton.

Influence of Colors of Luminous Sources on Their Sensibility to N-rays.

C. R. 138, pp. 1592-1593, June 20, 1904.

E. Rothe.

Photographic Method for Studying the Action of N-rays on Phosphorescence.

C. R. 138, pp. 1589-1591, June 20, 1904.

F. P. Le Roux.

Apparent Variations in the Luminosity of a Phosphorescent Screen When Examined in a Dark Room.

C. R. 138, pp. 1413-1415, June 6, 1904.

A. Broca.

N-rays and the Brain.

C. R. 138, pp. 1161-1163, May 9, 1904.

A. Broca and A. Zimmern.

Study of the Spinal Chord by Means of N-rays.

C. R. 138, pp. 1239-1241, May 16, 1904.

J. Becquerel and A. Broca.

Radiation from Nerve Centers Under Anesthetics.

C. R. 138, pp. 1280-1282, May 24, 1904.

J. Becquerel.

N-rays and Anaesthetics.

C. R. 138, pp. 1159-1161, May 9, 1904.

Part Played by N-rays in Alteration of Visibility.

C. R. 138, pp. 1204-1206, May 16, 1904.

Simultaneous Emissions of N-rays and N_1-rays.

C. R. 138, pp. 1332-1335, May 30, 1904.

Anaesthesia of Metals.

C. R. 138, pp. 1415-1418, June 6, 1904.

Contributions to the Study of the N-and N_1-rays.

C. R. 138, pp. 1486-1489, June 13, 1904.

Action of a Magnetic Field on the N- and N_1-rays.

C. R. 138, pp. 1586-1589, June 20, 1904.

Nature of the N- and N_1-rays and Radio-activity of the Bodies Emitting these Rays.

C. R. 139, pp. 264-267, July 25, 1904.

Refraction of the N-and N_1-rays.

C. R. 139, pp. 267-270, July 25, 1904.

Comparison of Effects of β- and N- and of α- and N_1-rays on Phosphorescent Screen.

C. R. 139, pp. 40-42, July 4, 1904.

O. Lummer.

Blondlot's N-rays.

Deutsche Phys. Gesell, Verh. 5, 23, pp. 416-417, Dec. 15, 1903.

Contribution Toward the Explanation of Blondlot's N-rays.

Phys. Zeitschr. 5, pp. 176-178, March 1, 1904.

H. Zahn.

Blondlot's N-rays.

Phys. Teischr. 4, pp. 868-870, Dec. 15, 1903.

H. Baumhauer.
Observations with a Blende Screen.
Phys. Zeitschr. 5. p. 289, June 1. 1904.
H. Guilleminot.
Present State of the N-ray Question.
Archives d' El Medicale 12, pp. 373-382, May 25, and pp. 407-410, June 10, 1904.
E. Salvioni.
Blondlot's Rays.
Accad. Lincii Atti 13. pp. 610-616. June 4, and pp. 703-706, June 19, 1904.
A. A. Campbell Swinton.
Blondlot's N-ray Experiments.
Nature 69, p. 272, Jan. 21, 1904.
Blondlot's N-rays.
Nature 69, p. 412, March 3, 1904.
S. G. Brown.
Blondlot's N-rays.
Nature 69, p. 296, Jan. 28, 1904.
J. B. Whitehead.
Various Radiations.
Elect. World and Eng. 43. p. 310, Feb. 13, 1904.
J. B. Burke.
Blondlot's N-rays.
Nature 69, p. 365, Feb. 18, 1904, and Nature 70, p. 198, June 30, 1904.
W. A. D. Rudge.
N-rays.
Nature 69, pp. 486-487. March 24, 1904.
J. G. McKendrick and W. Colquhoun.
Blondlot's N-rays.
Nature 69. p. 534. April 7. 1904.
F. E. Hackett.
Photometry of N-rays.
Roy. Dublin Soc. Tans. S. 10, pp. 127-138, Sept., 1904.
R. W. Wood.
The N-rays.
Nature 70. p. 530, Sept. 29, 1904.