A quarter of a mile before reaching the curve near Rangsdorf, we shut off the current and apply the full power of the brakes. The speed of the car drops to 102 miles. The curve is rounded in a noble swing. The brake is released, and the car glides along under its own momentum without any current whatever until Zossen is reached. In eight minutes we have leaped from Marienfelde to Zossen. We crowd around the telegraph instruments, which have recorded a speed never before attained in the annals of railroading. The telegrapher can hardly attend to his instruments, so many heads are pressing about him. Finally he succeeds in reading off the record—130.4 miles an hour. Everyone smiles; hands are shaken, congratulations exchanged. An officer rushes off to the telegraph station to announce to His Majesty the Kaiser the feat which German engineers have succeeded in performing.

"The front end of the car is covered with flies, bees, and small insects, crushed as if by a thumb against the iron and glass."

THE FINSEN LIGHT-CURE IN ENGLAND.

BY HERBERT C. FYFE.

King Edward and Queen Alexandra paid a visit the other day to the London Hospital in order to open three new departments lately added to the hospital. The first of these is known as "Queen Alexandra's Light Department," for Her Majesty was the first to introduce the Finsen light-treatment into England, presenting a four-tube lamp to the London Hospital in 1900.

In a large room of the London Hospital, ten lamps of various kinds are being used. In a smaller room cures are being effected by means of the Röntgen rays. The other two departments are the electro-therapeutic, where all kinds of electrical treatment are given, and the radiographic, where photographs are taken for the purpose of locating foreign bodies.

Dr. Niels R. Finsen is the director of the five new buildings in Copenhagen known as "Finsen's Medicinske Lysinstitut," which was founded by the Danish government. Since 1890 Finsen has devoted himself to work on phototherapy or the therapeutic influence of the various rays of the solar spectrum. His first great result was the red-light treatment for small-pox, which is now being used all over the world with splendid results.

The result of the red-light treatment is that suppuration is usually abolished. Scars are extremely rare, and the duration of the disease is shortened. Turning now with renewed energies to his chosen field of research, Finsen soon found that the chemical rays were of inestimable value in curing lupus and like eruptive skin diseases. He finally discovered his world-famous method of treating local superficial bacterial skin diseases by the concentrated chemical rays of light. The method is founded on the following facts, which have been proved after a long series of experiments:

1. That the chemical rays of light (particularly the violet and ultra-violet) are capable of destroying bacteria.

Prof. Finsen has found that, on days of bright sunshine, at noon, in July and August in Copenhagen, sunlight will kill bacteria in a few hours, and that an electric arc lamp has the same bactericidal property. But neither the rays of the sun nor of the electric lamp are sufficiently strong by themselves to kill bacteria growing in the skin; if they were, then all bacterial skin diseases would be cured spontaneously in the summer.

Prof. Finsen soon discovered that he must *concentrate* the light by means of special apparatus in such a way that it contains as many blue, violet and ultra-violet rays as possible. This concentrated light, whether it be sunlight or electric light, will kill in a few seconds bacteria which were destroyed by ordinary light in as many hours.

2. That the chemical rays of light can produce an inflammation of the skin; and

3. That these same rays have the power of penetrating the skin.

The Finsen treatment may be divided into two varieties: the treatment by sunlight and the treatment by electric light.

In the treatment by sunlight, the apparatus used consists of a lens of about 20 to 40 centimeters (7.8 to 14.7 inches) in diameter. The lens is composed of a plane glass and a curved one, both framed in a brass ring. Between them is a light blue, weak, ammoniacal solution of copper sulphate. As one surface of the liquid is plane and the other one curved, its optical function is that of an ordinary plano-convex glass lens.

In order to avoid burning the skin of the patient it is necessary to cool the light by eradicating the heat rays of the spectrum, and this the lens accomplishes. By making the lens of a blue liquid instead of solid glass, a considerable cooling of the liquid is effected, for the reason that water absorbs the ultra-red rays and the blue color excludes a considerable number of the red and yellow rays. These three kinds of rays have particularly strong heating effect, while their bactericidal power is insignificant. The blue, violet, and ultra-violet rays, which it is important to procure in as great a number as possible, are but very slightly impaired by passing through the blue liquid.

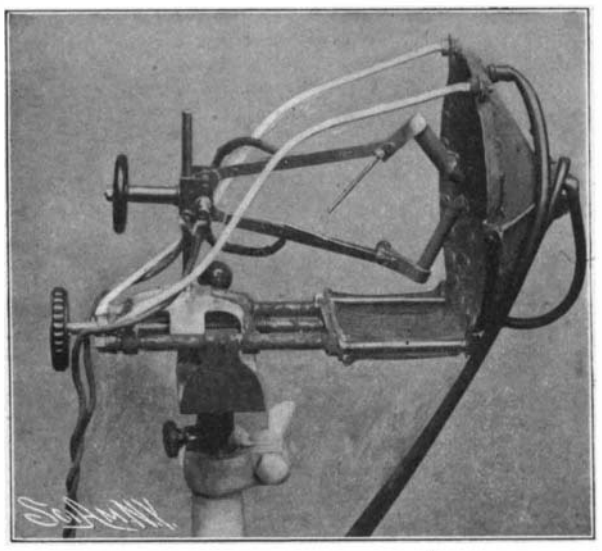
The lens can be raised or lowered as well as turned on a vertical and a horizontal axis, and thus is capable of concentrating the rays of light upon any portion of the skin which it is desired to treat.

Where sunlight is not available (in Copenhagen and London this is unfortunately very often the case) light from an electrical source is requisitioned. In the general arrangement of the original lamp is included a central electric arc, protruding from which are four brass tubes which remind one of telescopes. Each tube consists of two parts, inside of which are fixed lenses of quartz, used because this material to a far higher degree than glass allows the ultra-violet rays of shortest wave length to pass through. It is just these ultra-violet rays that have a considerable bactericidal effect.

The reason that glass and not quartz is used in the sunlight apparatus is that all ultra-violet rays of short wave length emanating from the sun have been absorbed by the atmosphere before they reach the lens and that the longer rays can quite easily pass through glass. Between the lenses in the tube there is distilled water, which cools the light by absorbing the intensely heating ultra-red rays, but does not impair the blue, violet, and ultra-violet ones.

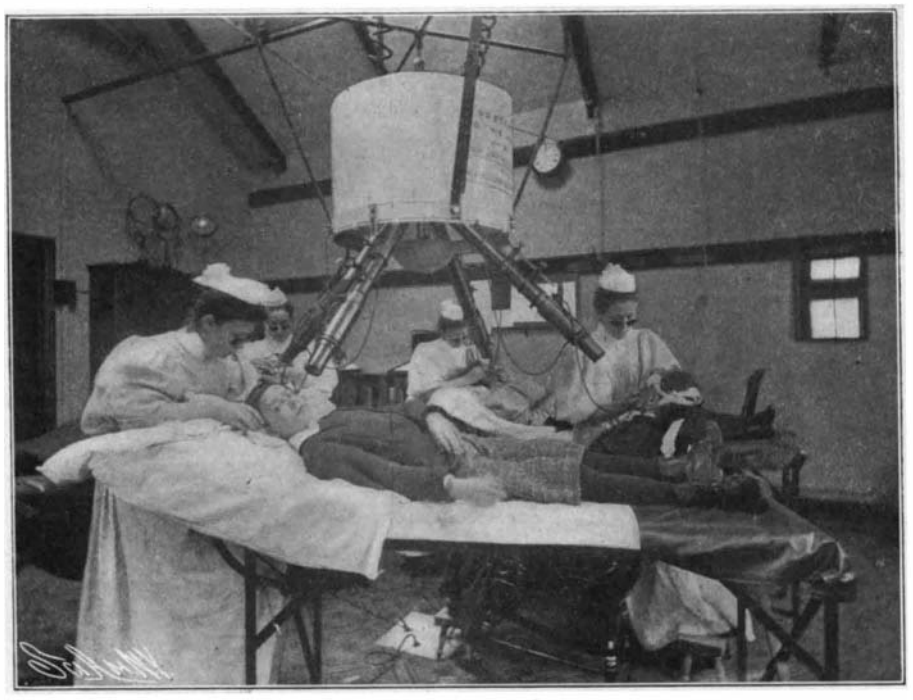
Dr. Finsen explains that it is not possible, as in the sunlight apparatus, to make the water blue in order to cool the light further, because the extreme ultra-violet rays which abound in the electric light might well pass the quartz but get absorbed by the blue coloring matter; the advantages of using the lenses of quartz would consequently be lost. In order to prevent the distilled water from boiling by absorbing the ultra-red rays, cold water is made to circulate around it.

Notwithstanding the fact that the special arrange-

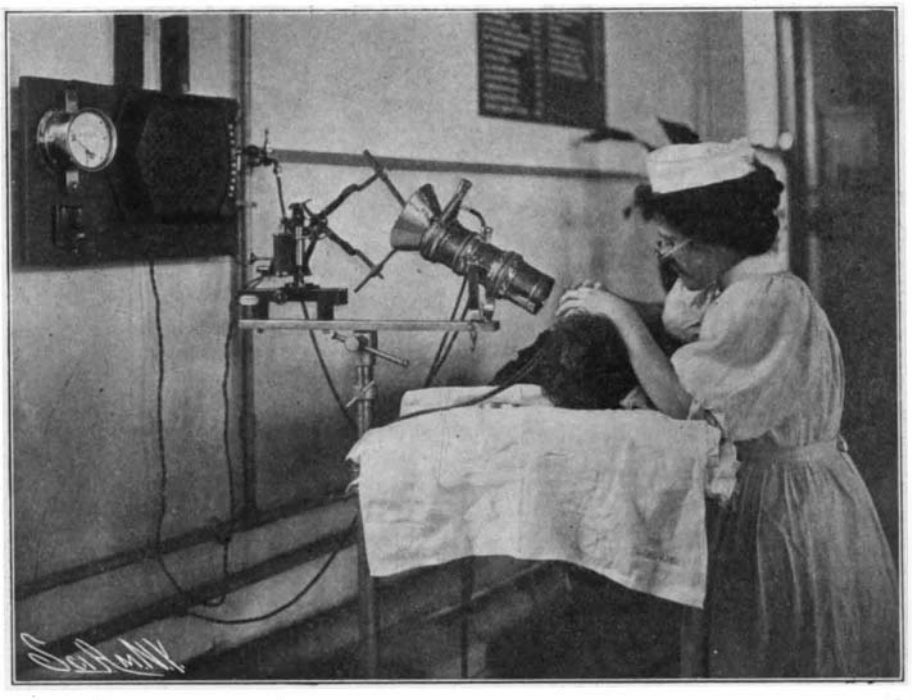


One of the New Ultra-Violet Ray Lamps Designed by the London Hospital Staff.

The Interior of the Finsen Medical Light Institute at Copenhagen.



Treating a Patient with the Finsen Apparatus Presented by Queen Alexandra to London Hospital.



Dr. Finsen's New Apparatus for Light-Treatment.

ments we have been describing for cooling the rays both from the sun and from an electric lamp arc have been devised, the light is still in both cases too warm to be applied to the skin without injury, and it is necessary to cool the skin in order to avoid burning.

To this end a little apparatus is employed, consisting of a plate of quartz and a plain convex lens of quartz, both framed in a conical brass ring which carries two small tubes and four arms; to each arm is fastened an elastic band, by means of which the apparatus is pressed against the skin. By making cold water run into one of the tubes and out of the other, the skin can be cooled to such a degree that it can stand even the strongest light. Furthermore, the pressure which the plano-convex quartz lens excites on the skin makes it anæmic, and thus allows the chemical rays to penetrate much better than were this not the case. The red color of the blood acts like red glass in opposing the passage of any light but red. In treating patients, an area of skin of about 1½ centimeters in diameter is subjected to the light rays for one hour every day.

One photograph shows a lamp which was invented by the staff of the Lupus Department of the London Hospital. The earlier telescopic form is abandoned and the light from the carbon poles is simply passed through a water lens. It was found, however, that much better effects were obtained when the light rays were concentrated by means of lenses. The latest lamps are supplied with continuous current at 50 volts and 15 amperes. The original four-tube lamp took 45 amperes. Powerful lenses are placed in the telescopic tube, and distilled water is circulated through the tube.

Various other kinds of lamps have been tried at the London Hospital. In some, lenses of rock crystal are used. In the "Broca-Chatia" lamp one of the cores of the carbon rods is of cast iron which, it is claimed, gives ultra-violet rays three times greater than ordinary carbons, and will do as much for a lupus patient in 20 minutes as Finsen does in 1¼ hours. No water circulation is used, and the tissues need not to be pressed free of blood.

The original Finsen four-tube lamp costs about $500 and $2,500 a year to maintain in constant working order. The newer single-tube lamps cost only about $75 to $100 and only $750 a year to run, while Dr. Bang, of the Copenhagen Light Institute, has, it is said, just produced a new lamp with iron electrodes which costs but $15, and which can effect with 5 amperes what the Finsen lamp effected with 60 amperes in 1¼ hours.

In the Kjeldsen lamp one pole is of carbon and one of mercury, and it is claimed that this produces rich actinic rays.

The Finsen treatment has been found effective in cases of lupus vulgaris, lupus erythematosus, epithelioma cutaneum, acne, alopecia areta, erysipelas, various minor eruptions, and in rodent ulcers. Patients have been now under treatment for some years and in hardly any cases have the diseases made their reappearance.

Nowadays, so soon as the first stages of the disease are observed, the patient is placed under treatment, and the chances of complete cure are of course infinitely greater than if the disease has obtained a firm hold.

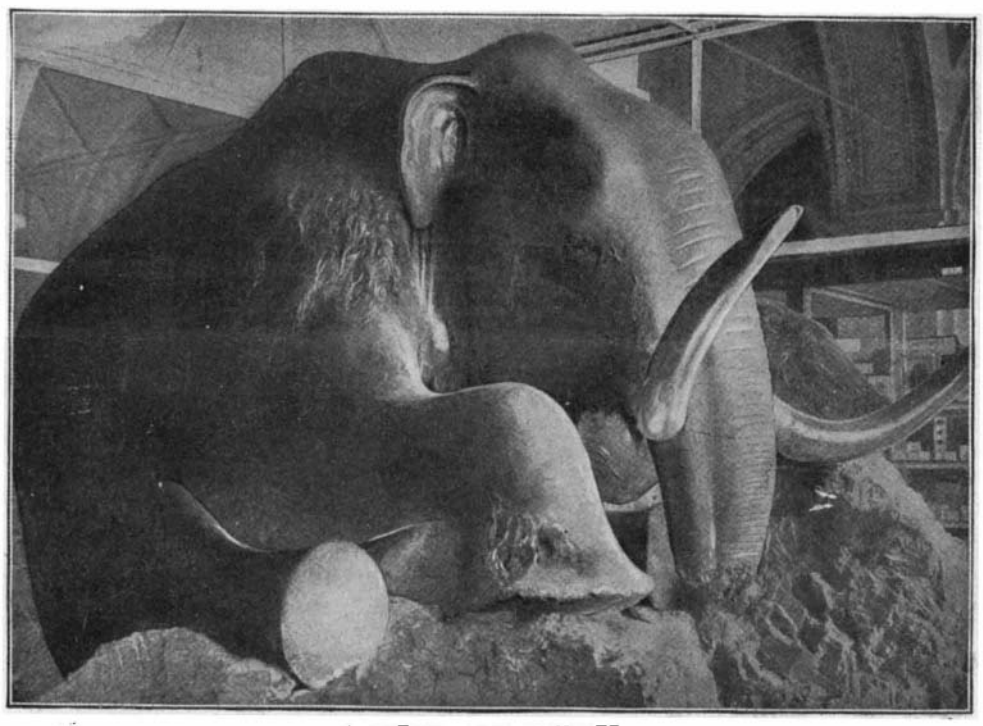
Since the invention of phototherapy and the recent improvements which have been made in the technique of the operations, there is no other form of tuberculosis which is easier to cure. The statistics which have been collected at the Finsen Institute from the end of 1895 to the first of 1902 relate to 804 cases, including all the patients afflicted with lupus who presented themselves at the institute. The number of patients who were entirely cured is 412; those whose cure is nearly complete with but slight traces of the malady, 192. The cases still under treatment number 117, of which 91 show an improvement and 26 remain about stationary. The treatment was interrupted for different reasons in 83 cases, by death or other grave malady 44, and for outside reasons 23, leaving but 16 whose treatment was stopped as being unsatisfactory. From the total of these results, it is shown that 695 cases out of 804 have been favorably influenced by the treatment, and many are cured entirely. But it must be remarked that many of these cases date from 30 to 50 years back, and of course are most difficult to cure. Dr. Finsen states that in the recent cases the cure is almost certain, and as the new cases are being treated as soon as they appear, it is expected that Denmark will soon be free from this malady.

A SIBERIAN MAMMOTH.

The huge body of the Siberian mammoth which was discovered in the summer of 1901 has now been erected in the museum of the Academy of Sciences at St. Petersburg, and is here illustrated for the first time. The unique interest of this discovery lies in the fact that though many fossil remains of mammoths have been found, and other preserved bodies of mammoths seen, no body so complete as this one has ever before been brought home to civilization. The hide, hair, eyes, flesh, and bones of the mammoth brought home by Dr. Otto Herz are all marvelously preserved by a set of circumstances similar to those which have given us the actual feathers of the extinct moa bird and the bony hide of the mylodon.

Dr. Herz describes the long hair and the thickness of hide of the mammoth, and how the stomach was found full of undigested food. The attitude in which he was found shows that he met his death by slipping on a slope, for his rear legs are bent up so that it would be impossible for him to raise himself. Dr. Herz writes:

"The impromptu grave into which the animal plunged was made of sand and clay, and his fall probably caused masses of neighboring soil to loosen and cover him completely. This happened in the late autumn, or at the beginning of the winter, to judge by the vegetable matter found in the stomach; at any rate, shortly afterward the grave became flooded, ice following. This completed the cold storage, still further augmented by vast accumulations of soil all round—a shell of ice hundreds of feet thick, inclosed by yards upon yards of soil that remain frozen for the greater part of the year. Thus the enormous carcass was preserved for how long no one knows, through hundreds of centuries perhaps, until not so many years ago some movement of the earth spat forth the fossil mausoleum, leaving it exposed to sun and wind until gradually, very gradually, the ice crust wore off and revealed to the passing Cossack the hidden treasure."



A PREHISTORIC MONSTER.

The mammoth whose actual appearance in the flesh has now been so marvelously preserved for us was known to early man, but appears to have died out completely before the advent of what are known as neolithic times. Thus his remains (teeth and bones) are found along with very old human remains of the early stone age, and a lifelike and unmistakable engraving of a mammoth has recently been discovered in the grotto of Combarelles, in France. How far early man assisted in the disappearance of the mammoth is not an easy matter accurately to determine.—The Sphere.

The report of the Uganda Railway Committee on the progress of the works for 1902-3 has just been issued. It states that, with the exception of a small tunnel and two other short deviations, the earthworks are finished, and that 27 large viaducts were erected during the year, the whole of the bridges and culverts for a distance of 948 miles having now been completed. The station buildings have been finished throughout the line. There are 43 stations, including Mombasa, the terminus at the coast, Port Florence, the terminus on the lake, the headquarters, and four other engine-changing stations. Coming to the rolling stock, the report states that 22 small locomotives, worn out by construction service, have been removed from the returns, together with 125 wooden material wagons. Eighteen engines have been fitted with automatic brakes, and they are being fitted to the whole of the passenger stock and a proportion of the goods vehicles.

Spectroscopical Determinations of Atomic Weights.

It has been known for some time that there is some connection between the spectrum lines of the elements and their atomic weights. This is shown, for instance, by a comparison of the spectra of alkali metals, in which the lines are found to approach the red of the spectrum for increasing atomic weights.

These relations form the subject of a paper by G. Runge read before the recent congress of German naturalists, held in Cassel. On closer investigation it is shown that each line of one element will correspond with a given line of another element, the structure of each spectrum thus being perfectly regular. When combining the lines by groups in so-called series, the same image is obtained for each element, any two images corresponding. This connection of the spectra, it is true, has not so far been possible for any groups of chemical elements. Wherever series are found, as for instance with Mg, Ca, Sr, Zn, Cd, Hg, Ai, In, Tl, Cu, Ag, Au, the series lines at least may be connected with one another. As regards the numerous remaining lines, impossible of being arranged in series, other criteria have to be resorted to in order to arrive at a connection from one element to another. Similar criteria are afforded by:

1. The aspect and behavior of the lines, which may be easily reversible, enlarged or well defined, the variation of the wave length under the influence of varying pressures, the luminous intensity at different temperatures in the Bunsen burner, the electric arc, the spark, in the case of self-inductions being inserted, etc.
2. The law of constant vibration differences.
3. The behavior of the line in the magnetic field.

If the different corresponding lines of a group of elements are found, the periods are a simple function of the square of the atomic weight, it being possible to determine either graphically or by means of empirical formulæ the atomic weight of an element from the atomic weights of related elements.

If the analytical form of this function were known, this method would afford a very accurate means of determining weights. For the corresponding line pairs of constant vibration differences, an empirical formula may be established, representing with a high degree of accuracy the distance of the two lines of a pair, in terms of the atomic weight. The distance within a group of chemically-related elements is, in fact, proportional to a certain power of the atomic weight, the logarithms being lineal functions of one another. This law has been applied by the author with the assistance of Mr. Precht to a determination of the atomic weight of *radium*, when the strongest radium lines were found to form pairs with constant distances. The lines, as shown by the author, will correspond according to the Zeeman effect with certain pairs in the spectra of Mg, Ca, Sr, Ba, the distance of the two lines of a pair increasing from one element to another along with the atomic weight. When plotting the distance in forms of the atomic weight, the value of the atomic weight of radium, as found by extrapolation, is 257, whereas Mme. Curie gives 225. The author thinks the substance used by the latter experimenter to have contained some barium, which would account for the high departures stated.—A. G.

The "Sleeping Sickness."

The British authorities in Uganda are making great efforts to discover the source of the terrible "sleeping sickness" which periodically decimates the natives of that territory and other parts of Africa, and, if possible, to find a means of preventing its spread. In May last year the Royal Society dispatched a commission to Entebbe, Uganda, for the purpose of investigating the disease, and early this year a second commission was sent from England for the same purpose.

The conclusions of the joint commission are now available through the publication of a progress report. This shows that the disease is caused by a minute parasite in the blood, which could not be conveyed from man to man. Consequently suspicion fell upon the tse-tse fly, a species of which, similar to the one prevalent in Zululand, was found abundant in Uganda, and experiments are now in progress to settle whether the Uganda tse-tse carries in its blood the identical parasite which is peculiar to the disease, and whether it can pass it to an animal.

One rather tentative experiment seems to show this, and it is expected that the truth or falsity of the theory will soon be determined.