### Lantern Condensers.

For many years a plano-convex lens, flat side next to the light, and a double convex of crown glass have been employed, but this is now being gradually supplanted by the two plano-convex lenses described. The most perfect system of this class is when the face of the lens nearest to the transparency is not quite flat, but slightly convex.

A great increase of illumination is often to be obtained by the interposition of a third lens between the light and the condenser. The form of this lens should be plano-convex, or, by preference, of a slightly meniscus shape, although, from such trials as we have made, we do not find any very marked degree of advantage in the latter. The gain in illumination arising from the employment of a supplementary lens, such as that described, was proved in one instance to exceed 30 per cent. But as this third lens will necessarily be close to the light, it must not only be placed somewhat loosely in its setting—to allow of expansion of the glass by the heat—but it must be warmed up slowly and thoroughly before being introduced into the lantern, otherwise the heat may cause it to crack.

The great object in a condenser is to collect the largest possible amount of light emitted from a burner, and cause it to be projected forward to the object glass in a manner as free from observation as possible. When the condenser consists of two lenses, the first one collects the rays of light which diverge from the flame, and transmits them in a nearly parallel manner to the second, its function being to converge them to a point at a distance equaling the position of the front lens of the object glass, or nearly so. If the eye were situated at the apex of this cone, it would perceive the whole of the condenser to be one mass of intense illumination, no one part being brighter than another.

It may be asked why one lens would not answer the purpose of a condenser instead of two. We reply that it is not possible to effect the transmission of a large angle of light by one lens alone. While some of the cheap toy lanterns have a single condenser of the "bull's eye" or hemispherical form, yet is the angle of light transmitted but small, owing to the spherical aberration of single lenses having short radii of curvature. Hence must a good condenser consist of at least two elementary lenses.

We may here observe that if the purpose of the lantern be the production of enlargements from negatives of cabinet or greater size, then must the diameters of the condensers be increased in a corresponding ratio. For purposes of this nature, the condensers may with advantage be eight inches in diameter.—*Photo. Times.*

### Locomotive Cars for the Transcaspian Railway.

The Russian government is having built, at the engineering works of M. Struve, at Kolomna, some locomotive cars of a special type for the Transcaspian Railway, designed to meet two difficulties—the waterless character of a large section of the line and the insignificant ordinary traffic. To meet the former, the locomotive car is equipped with tanks containing sufficient water to last seventy miles. As the waterless stretch from Michaelovsk to Kazantchik is about fifty

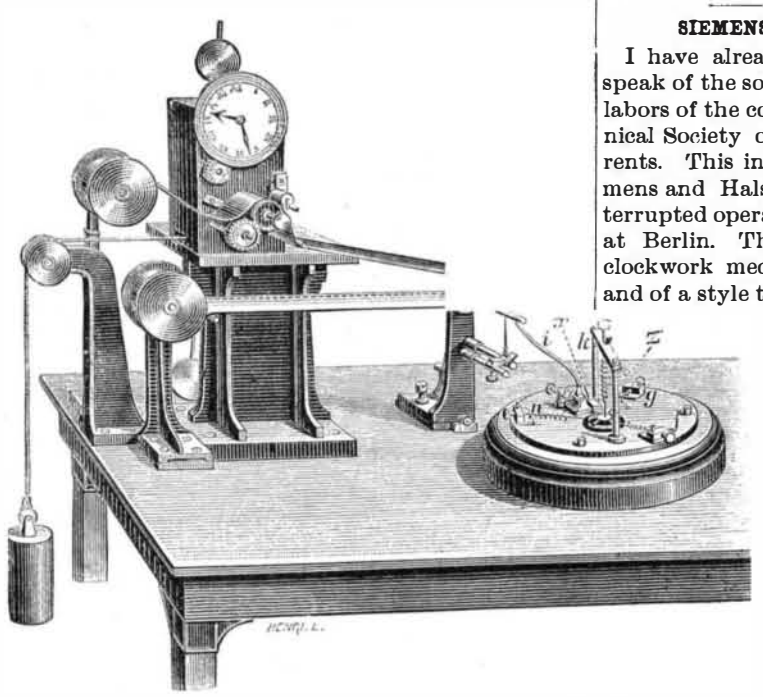
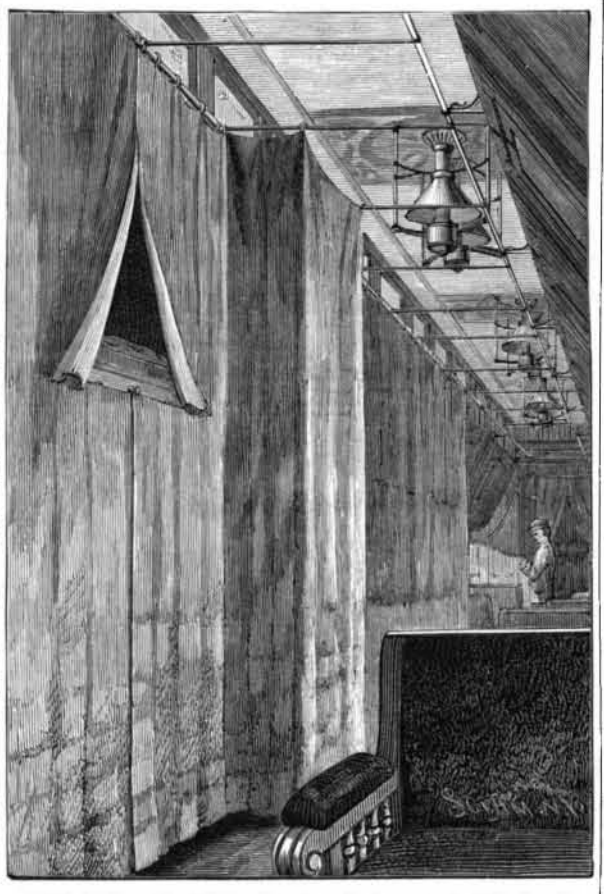


Fig. 1.—SIEMENS & HALSKE'S SOOT INDICATOR.

miles in length, this supply is expected to be amply sufficient under any contingencies that may occur. With regard to the second difficulty, the locomotive has been constructed with a car connected to it, and capable of conveying eighty passengers. The locomotive car will be warmed by the exhaust steam from the engine, and there will thus be an economy in the consumption of fuel—an important consideration in a country where no timber or coal exists, and where the winters are extremely severe.

### MOVABLE DRESSING CLOSET FOR SLEEPING CARS.

The object of the invention herewith illustrated is to provide a shelter or screen for use upon sleeping cars of the Pullman model, whereby the occupants may stand upright in the aisle and dress without being within sight of other passengers. The closet is made by a curtain suspended from four hooks on stationary cross rods, and extends about one-third across the aisle,



MOVABLE DRESSING CLOSET FOR SLEEPING CARS.

leaving ample space for people to pass. The cross rods are about 30 inches apart, making the width of the closet, up and down the aisle, about the same. To close the closet, the hooks carrying the outer corners are moved up against the curtain rods of the car, thereby drawing the closet curtain up against the berth. The arrangement of the main curtains is clearly shown in the left of the engraving. Each curtain is cut back on the line of the upper berth about one foot; a hook on each corner is placed over the edge of the upper berth, so as to hold up the lower part of each curtain. It will be seen that the occupant of the upper berth can get in or out of the same without opening the lower curtains, while the movements of the occupant of the lower berth do not in any way interfere with his neighbor. The advantages possessed by this closet over the old style of curtains are apparent.

This invention has been patented by Mr. A. J. Chandler, whose address is care of C., I., St. L. & C. Railroad, Cincinnati, O.

### SIEMENS AND HALSKE'S SOOT INDICATOR.*

I have already more than once taken occasion to speak of the soot indicator, especially apropos of the labors of the committee appointed by the Electrotechnical Society of Berlin for the study of telluric currents. This indicator was constructed by Messrs. Siemens and Halske, and has now been in almost uninterrupted operation for three years in the central office at Berlin. The apparatus consists essentially of a clockwork mechanism, which actuates a paper band, and of a style that marks the deflections (Fig. 1). This paper band is blackened every twenty-four hours. The tracings made by the style are fixed by means of a solution of colophony in benzine applied with a pencil.

Beneath the platform of the apparatus there is arranged an electro magnet, which is excited by 20 elements. This electro is shown in diagram in Fig. 2, where N is a solid piece of iron around which is wound an insulated conductor, whose extremities communicate with the poles of the battery, and which forms one of the poles of the magnet. The other pole of the magnet is concentric at N. Between S and N is placed a bobbin, whose winding is connected with the ground conductor. This bobbin is suspended from a spiral spring, *z*, and attached by wires to the points, *j*, *g*, and *n* (Fig. 1). The bobbin is so wound that the deflections of the needle, *i*, shall be proportional to the intensity of the current that is traversing it. The entrance and exit wires of the bobbin are attached to the terminals, *j* and *g*, respectively.

* Dr. Michaelis, in *La Lumiere Electrique.*

The apparatus is interposed in terrestrial lines as follows:

The ordinary cable that connects Berlin with Dresden is used. This consists of 7 insulated wires that are surrounded in a body by an insulating envelope. This latter is surrounded by non-insulated wire that serves to collect the telluric currents along its entire length. At Dresden, one of these copper conductors is connected with the winding wire, and at Berlin the apparatus is interposed in the metallic circuit thus formed.

When telegraphing is being done, the wires exert an induction upon each other, so that the curves traced by the apparatus consist of a succession of slight oscillations (especially during the day). The curves are extremely well defined.

### Absorption of Nitrogen by Soils.

The remarkable statements of M. Berthelot respecting the fixation of atmospheric nitrogen by certain descriptions of soil have attracted considerable notice. M. Joulie has contributed to the *Comptes Rendus* an account of some carefully conducted experiments of his own which corroborate M. Berthelot's results. In these experiments, M. Joulie placed equal weights of soil in glass pots, watering the samples automatically with distilled water, and protecting the surface from any possible contact of ammonia-bearing substances, while leaving it freely exposed to the air. Different species of plants were raised from the soil under observation; the crops being at the end of every season dried, weighed, and analyzed. The soil also was similarly treated, in order to ascertain whether this and vegetation together had gained or lost nitrogen.

By operating in this way upon many samples of soil, tested during a series of years, M. Joulie has satisfied himself that nitrogen has been gained (often in considerable quantity) in two descriptions of soil—the one being a loam and the other a sand devoid of clay. The results have been very fairly uniform in quality, but differ in quantity. The bed of soil in these experiments was about one decimeter thick; and if it may be admitted that the same amount of fixation might take place over the area of a hectare of meadow and throughout a layer of the same thickness, the weight of which would be about 2,000 tonnes, the weight of nitrogen thus fixed would not be less than 1,144 kilogrammes. If the area of surface only, and not depth, is to be taken into consideration, the result would be to diminish the approximate fixation of nitrogen to 432 kilogrammes per hectare. In M. Joulie's opinion, this action is not to be attributed to any other cause than the direct absorption of atmospheric nitrogen; but he admits that a further series of experiments upon samples of soil without vegetation is necessary to clear up the only doubt existing on the point.

### Cholera.

Henry Downes, M.D., Deputy Inspector-General of Hospitals, Springfield, Tiverton, England, says his experience of the disease enables him to deduce the following conclusions:

1st. That cholera is the result of atmospheric influences generated in localities in which numbers of men are assembled without due regard to sanitary precautions.

2d. That cholera is only an aggravated form of diarrhœa, and that its later symptoms are the result of the long continuance of this disorder and of a sudden loss of a large portion of the watery constituents of the blood, these symptoms being a shrinking of the whole body, blueness of the surface, cramp of the lower

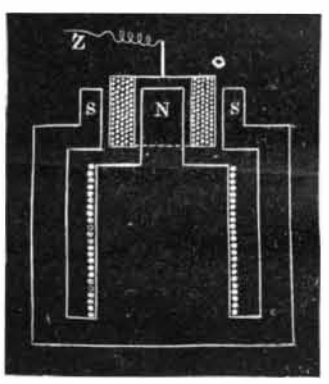



Fig. 2.—DIAGRAM OF ELECTRO MAGNET.

extremities, obstinate vomiting, diminution of the pulse, and gradual cessation of the heart's action.

The nature of the contagion, or in what manner it is received into the system so as to produce these results, has not been ascertained; but in my opinion it is most probably gaseous, existing in the atmosphere, and is received into the human body by respiration through the medium of the lungs. As long, therefore, as large numbers of men are assembled within a confined space, without due regard to sanitation, will cholera be produced, and prove fatal to many thus situated; and although up to the present day we are in possession of no antidote, there is one remedy which is often available, and that is immediate removal from the locality in which the disease is prevalent.