PORTABLE OUTLOOKS FOR ARTILLERY TRAINS.

BY DR. ALFRED GRADENWITZ.

A novel type of portable outlook for artillery trains has been recently designed by a German firm, the object being to allow men to note the effect of their own fire.

As shown in Fig. 1, the limber-pole of a field gun may be used as an observing station. The cartridges are carried in the limber case. The pole is hinged so that it can swing vertically. A special foot supports it on the ground.

Before erecting the pole a rope ladder with a shield is fixed in place. The rope ladder is tightened automatically as the pole is swung into position. The protective shield, when not in use, is carried in front on the gun limber arms and on the case frame, and at the same time serves as a foot rest for the men seated on the limber. All the instruments used for observation are carried in receptacles below the foot rest as well as in the limber case itself.

The operator is equipped with a strap and hook, by means of which he attaches himself to the pole. The rope ladder may be fitted at the top with an additional seat consisting of two rope ends and a transverse beam on which the operator may seat himself (see Fig. 2). Instead of a rope ladder, the pole may be provided with lateral rungs which, when out of use, are folded and received in recesses, thus eliminating any risk of injuring the horses.

Fig. 2 represents the limber of a 15-centimeter howitzer. The observing station is similar to the one shown in Fig. 1, with the exception that it is made up of two poles fastened end to end.

In Fig. 3 an ammunition caisson is represented for individually located field guns. These can be turned up so that the bottom constitutes the front of the shield. The armor is thicker in front than on the sides and roof. Below the bottom is located the box containing the observation ladder, which is likewise armored. The ladder is of the telescopic type, and can be extended and collapsed by means of a tackle. It is equipped with a top seat, telescope support and map table, all foldable.

Fig. 4 represents a three-section observation car. The observation ladder is swung up by means of a winch and tackle. Because of its height, the ladder is held by guy wires. All the necessary instruments such as telephones, etc., are installed in the driver's box.

It may be said that observation wagons are by no means new. In fact they have been used as far back as in the fifteenth century for scaling the walls of fortresses. Later they were used in fighting fire, and now we find them restored to their military dignity.

Fig. 1.—Single-section ladder and shield.

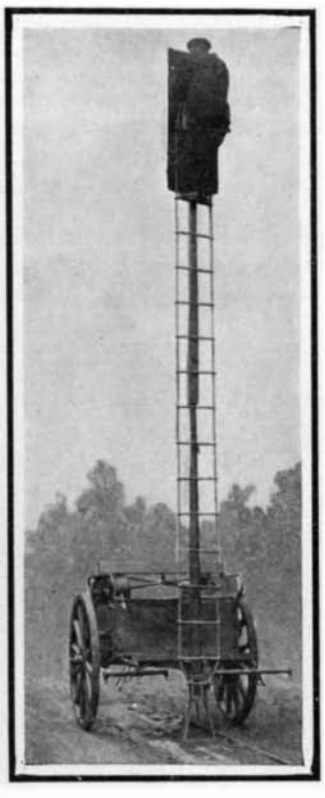

Fig. 2.—Two-section ladder.

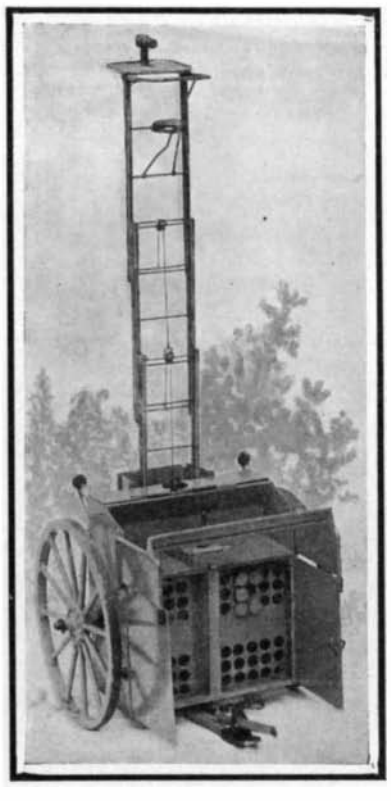

Fig. 3.—Telescoping ladder.

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Fig. 4.—Three-section observation ladder.

Cinematophthalmia.

The illusion produced by the cinematograph is explained by the persistence of luminous impressions on the retina. The duration of the impression varies according to the intensity of illumination, the frequency of interruption, and various other conditions. Its average value is 2/45 second. In order that the moving scene shall be reproduced in a lifelike manner before our eyes, the pictures must move before the lens and follow each other at intervals a little smaller than 2/45 second, so that one impression still remains when its successor arrives, and thus the pictures blend together, to a certain degree.

This series of rapid and brief excitations produces, in time, a certain fatigue of the eyes and more or less persistent ocular troubles. A French physician, Dr. Ginestous, has studied these troubles and given the name of cinematophthalmia to affections of this character. These troubles are fortunately not very serious. Dr. Ginestous describes several forms. The first form is essentially temporary, and consists chiefly in lachrymation and photophobia, which compels the patient to close his eyes. The trouble begins with the passage of the first picture across the screen. In most cases the closure of the eyes for a few seconds is all that is required. The spectator appears to accustom himself, and adapt his retina to the new task which is imposed upon it. In a second and more lasting form of the malady, this retinal adaptation is impossible. As soon as the eyes are reopened, the symptoms reappear. Some watering of the eyes and slight redness of the conjunctiva persist after leaving the hall, but in most cases the symptoms rapidly disappear. In a third and still more prolonged type, a true conjunctivitis persists for two, three, or four days. It is usually accompanied with redness, burning and itching, lachrymation and photophobia, but without agglutination of the eyelids. Finally, in rare cases, there are troubles of accommodation, accompanied by headache and great difficulty in reading, writing, and seeing near objects.

Ophthalmias of this sort are not usually alarming. In most cases they heal rapidly, even without any treatment, and the most obstinate cases yield to very mild treatment. The best remedies are rest and mild eye-washes containing cocaine and adrenaline. The principal causes of the difficulty must be sought in the operation of the cinematograph.

I. Defects in sharpness of the pictures or in focusing the projecting apparatus make the seeing of moving pictures difficult and painful. The negatives should be as sharp as possible, for the corresponding positives are magnified in projection to nearly one hundred thousand times their area, and the defects of sharpness are magnified in the same proportion.

II. Place of the spectator. Charpentier has proved that the persistence of impressions on the retina depends upon the size of the retinal image, and that the persistence is less for near than for distant objects. Consequently, in a moving picture hall, the seats nearest the screen are not the best.

III. Fatigue is caused by luminous impressions which are too strong or too weak. According to Charpentier's researches, the persistence of luminous impressions diminishes as the illumination increases, and conversely. This law is confirmed by the phenomena of moving pictures. Bright and strongly-illuminated images are more fatiguing than others, and most fatiguing of all is the abrupt transition from black to white, or from dark to bright.

IV. According to the theory of the cinematograph, it is necessary to produce a regular and rapid alternation of images and eclipses. In order to obtain these results, the edges of the moving film are perforated with holes 4/5 inch apart, into which mechanical fingers enter and thus regulate the movement of the film and hold it during the necessary period. But in time these perforations become worn and a certain amount of play results, which causes vibration and blurring of the images. This fault, apparently trivial, is increased in direct proportion to the magnification of the projected image.

V. In order to prolong the spectacle, some operators move their films with the minimum speed physiologically necessary to produce the persistence of the retinal images. Hence the eye is compelled to make an effort to retain and superpose the successive pictures, and this effort necessarily causes retinal fatigue. The wearing of blue glasses has been recommended, in order to avert these inconveniences. The director of the Pathé establishment at Bordeaux suggests moving the hand, with the fingers separated so as to form a perforated screen, before the eyes. Dr. Ginestous rightly remarks that this device is not very practical.

The evil is not very great; it suffices to recognize its existence. Those persons whose eyes are fatigued by viewing moving pictures, have always the recourse of giving up this form of amusement. There are many worse privations.—Cosmos.

Seeing by Telephone.

To allow people conversing by telephone to see one another is known to be the ultimate goal of those inventors to whose labor we are indebted for the evolution of telephotographic apparatus. As the problem did not so far admit of any practical solution, inventors have, in fact, been satisfied with transmitting, by wire, photographic pictures, diagrams, handwriting, and the like. According to reports just received from Denmark, a satisfactory solution is now offered. In fact, two young Danes (the brothers Andersen) recently called at the offices of Politiken, the well-known Copenhagen daily, in order to submit to the editor the principle of their idea, particulars of which cannot yet be given out. Unlike the Korn apparatus, optical transmission, according to their scheme, is not effected by means of any material sensitive to light, such as selenium, nor is a picture produced by photographic or mechanical means as in all the apparatus so far suggested. Transmission, in fact, takes place simultaneously, so as to reproduce any objects situated at the sending station in their natural colors and motions, their dimensions, however, being reduced.

The apparatus is connected by a contact with the telephone wire, when the acoustic or optical currents can be thrown alternately through the line. The operator is thus able at will to show himself, or to

bring before the eyes of the person at the other end any objects he may like to show him. As the apparatus, so far from being necessarily located immediately beside the telephone, can be used within a considerable range, provided the contact be obtained, the possibilities of this invention are obviously many. Further details will be awaited with interest.

Fake Discoveries.

BY A. F. KUNBERGER.

In the January, 1909, number of the Journal of Industrial and Engineering Chemistry appeared an editorial, its contents being given here in part:

"The agitation against so-called patent medicines, which culminated in the National Food and Drug Act of 1907, also has served to awaken the public to the many deceptions which are being practised, and the many worthless preparations for general domestic use which are on the market. The results of this movement have been, first, to force a great many of the more palpable frauds to be withdrawn from the market; and, second, to provide for the correct labeling of all others, so that the purchaser may be in a position to buy intelligently. Only those materials, however, which may be classified under the head of food and drugs for the human system come within the scope of this legislation."

The writer mentions fake remedies offered in the market for the treatment of hard water for boilers and other products used in quantity in the industries. He concludes with an appeal to the chemical profession to take measures to suppress these chemical fakes, both by legislative and educational means. It is hard to see why people are so easily led into believing statements made in advertising literature, even if indorsed by those in positions of importance, who either out of ignorance or indifference have failed to investigate tests made in their presence before going on record as having witnessed them.

Some years ago a sample of a chemical supposed to render wood fireproof was submitted to us for analysis. A careful examination proved it to be common table salt, for which a price of 25 cents a package (about one pound) was asked, and undoubtedly was paid by scores of buyers. We know, of course, that salt acts to a certain extent as a protection; but by no means does it make wood fireproof, and at the best it is worth less than 1 cent a pound. Some time later two samples, one a pink and the other a blue chemical, were submitted to us for examination. A circular stated that the blue chemical added to gasoline would render it non-explosive; the same was claimed for the pink chemical if added to kerosene or coal oil. The circular also contained a number of testimonials from persons whom one would expect should know better, but undoubtedly they were not thinking deeply enough to consider what harm could grow out of their indorsement. One of the testers, the chief of the fire department of one of our large eastern cities, stated that in his presence the chemical was placed in a can containing gasoline, the fluid being ignited in the can and poured into another containing gasoline without exploding either of them. We wish to state that the oil termed gasoline is not explosive, and if ignited in an open can will burn with a smoky flame, so there was no merit in the material added. It is entirely different if gasoline which has been kept in a partly empty can for some time, is brought in contact with a lighted match or candle, or if the can should be opened near a flame or light of any kind, as an explosion will be the result of such carelessness. The explosion is due to the gases formed in the can, and these mixed with air are highly explosive; but nothing known at present will prevent this except precaution. And if there were a remedy, it would naturally have to destroy the qualities of the gasoline which make it valuable; that is, its ability to vaporize rapidly and at a low temperature. We made an analysis of both chemicals, which were offered at 50 cents a bottle containing less than an ounce of material, and found them to be common table salt, dyed the colors above mentioned. What attracts the attention of the general public at present is a material supposed to make ashes burn. It is sold, and to our personal knowledge was bought, at very fancy prices. We took the trouble to analyze a package, and found that it contained powdered calcium carbide with 30 per cent of free lime and coal dust. Whether these impurities were purposely mixed or their presence was due to an inferior grade of carbide, we did not consider sufficiently important to investigate. Any person of average intelligence ought to know that ash is a mineral admixture of coal and is non-combustible. All statements made by careless investigators to the effect that the addition of any of these compounds to their coal increased the calorific or heating power are ridiculous, and the good results exist only in the imagination of the user. The efficient way to obtain all the heating value contained in the fuel is to have proper grates and draft facilities, and to keep them clean. Clinker and ash should be removed by frequent raking, since too hard raking carries a large quantity of unburnt coal into the ash. There are hundreds of other compounds of a similar nature, which flourish long enough to fill the pockets of the "discoverer," and we cannot caution the reader too emphatically to stop to consider the feasibility of a so-called discovery before buying it and recommending it without having seriously investigated its merits.

A Remarkable Nile Fish.

A very peculiar fish (*Tetrodon fahaka*), which is called "fahak" by the Arabs, is found in large numbers in the Nile at high water. The fahak belongs to the group of globe fishes. In its normal condition it is ten or twelve inches long and of elongated shape. A thick mucus covers its entire body, with the exception of the abdomen, which bears numerous spines. The fish has a thick head, with a broad forehead and protruding eyes. The dorsal and anal fins are small, circular, and transparent; the caudal fin is larger, and of orange yellow color. In general, the colors of the fahak are bright and harmonious. The back is very dark blue, the sides are striped blue and orange, the abdomen is yellow, and the throat snow white. The mouth is of peculiar shape, each jaw being divided in the middle, so as to produce the appearance of four large teeth, whence the name *Tetrodon*, meaning four-toothed.

The most interesting peculiarity of the fahak is its power of inflating itself like a balloon, by drawing in a large quantity of air. Usually it swims in the manner of other fishes, but when danger threatens it rises quickly to the surface of the water and begins to pump air into an extension of the gullet. By this means the abdomen of the fish soon becomes so greatly distended that it exceeds the rest of the body in size. The fish loses its equilibrium, turns over, and floats on its back, and at the same time the spines of the abdomen are erected. By this transformation the fahak is protected against the attacks of its enemies. If one of these seizes it, the aggressor is wounded by the spines and thenceforth leaves the unpleasant creature alone. If the inflated fish is grasped by the hand it endeavors to draw in still more air, as if it were well aware of the importance of this action to its safety. When the danger is past, the air escapes with a slight hissing noise, and the fish gradually resumes its normal form.

The fahak is found in many streams of West Africa, but most abundantly in the Nile, which it ascends from the Mediterranean. It penetrates into the irrigating canals and ditches, and there lays its eggs. When the flood subsides, great numbers of the fish are left stranded and become the prey of birds of all sorts. They are also eaten by the peasants. Occasionally the use of the fish as food appears to cause poisoning. There is a story of two American sailors who died soon after eating the liver of the fahak. Such cases, however, appear to be very rare, and they are perhaps to be attributed to the use of decomposed fish. On the other hand, the *fugu* fishes, or Japanese species of *Tetrodon*, are extremely poisonous. As in the case of the European barbel, the muscular flesh is harmless, but certain other parts, especially the roe, liver, milt, but also the skin, abdominal wall, and intestines, are so poisonous that they have been used in Japan as a means of suicide and murder from time immemorial. In the Asiatic seas fugu poisoning often occurs among sailors and natives, and in Japan the sale of all species of *Tetrodon* is forbidden by law. The fahak is a great source of delight to the Egyptian children, who drive the inflated fish around and harry them until they literally burst. The children also inflate the dried fish and make handballs of them. The fahak is often found in curiosity shops, where it is bought by travelers as a memento of the land of the Pyramids. The fahak was known to the ancient Egyptians. Its representation occurs twice on the walls of a temple at Deir-el-Bahari.

Photographic Dyeing.

Sunlight, which destroys many organic coloring matters, also converts some colorless and soluble inorganic compounds into insoluble colored substances, which may thus be fixed in the interior of tissues. Many experiments in dyeing fibers and fabrics by the agency of sunlight have been made, especially by Persoz and Grueve. The following are some of the results obtained:

Sixty parts by weight of sulphuric acid were added to a solution of 120 parts of potassium bichromate in 1,000 parts of water. White wool and silk fabrics were dipped in this solution, dried in a dark room and exposed to sunlight. A beautiful light shade of brown was produced by from 10 to 20 minutes' exposure.

Prussiate of potash gives a medium shade of blue. If white cloth impregnated with this salt is exposed to sunlight under thick paper bearing a cut-out pattern, the design is reproduced in blue on the cloth, which is then rinsed in water to remove the unaltered prussiate from the parts which were covered by the paper.

Grueve found that very permanent shades of buff, blue, green, and gray can be obtained from ferrocyanides, and brownish violet, black and olive from chromates. For blue, the fabric is dipped in a solution containing 60 parts by weight of potassium ferrocyanide, 80 parts of tartaric acid and 24 parts of ammoniacal perchloride of tin, with more or less water, according to the shade desired. A short exposure to sunlight develops the blue color.

For green, sulphuric acid and an ammoniacal salt are used in connection with the ferrocyanide or yellow prussiate of potash. Buff shades are obtained by producing blue, as above, and treating the dyed fabric with caustic alkali, which converts the blue compound into yellow ferric oxide.

Gray and "mode" tints are produced by treating buff (obtained as described above) with an infusion of nut galls or Campeachy wood. Silk fabrics can be dyed in various shades of brown by impregnating them with copper chromate and exposing to sunlight.

The experiments prove that a certain quantity of moisture is required to produce brilliant colors with short exposure. Probably many substances which are employed in photography would produce desirable results in dyeing, but they are too expensive to be used for that purpose.

The Current Supplement.

The opening article of the current SUPPLEMENT, No. 1759, is devoted to a very exhaustive discussion of the wonderful aeronautical meeting at Rheims, France. Some splendid pictures of the more prominent aeroplanes in flight are presented. One of these photographs shows no less than three flying machines in the air. One of the most remarkable papers read before the Winnipeg meeting of the British Association for the Advancement of Science was that of Prof. Ernest Rutherford. In this paper he explains very lucidly how the modern scientist measures the atom. The electrolytic rusting of iron is discussed by Alfred P Morgan. N. W. Greenway writes on the comparative weights of reciprocating and turbine machinery for marine work. The most notable project for irrigation yet undertaken by the United States Reclamation Service has at last been completed, and will be thrown open to the public on September 23rd, for which reason Albert Wilhelm's excellent illustrated article on the subject of the Gunnison project (the project in question) should be read with some interest. Prof. Albert F. Ganz of the Stevens Institute of Technology writes thoughtfully on the progress in electric current development in the artificial lighting field. A good practical article which will be read with profit by the amateur is Clarence Biggs's "Fitting Electric Bells." Dr. D. T. Macdougal of the Carnegie Institution, one of our greatest biologists, writes on aridity and evolution. Prof. T. J. J. See has the distinction of being what may be called an astronomical revolutionist. In a paper entitled "The Origin of the Satellites" he sets forth his theory that satellites are in reality captured bodies, and that they did not spring from parent planets as we now suppose.

Official Meteorological Summary, New York, N. Y., August, 1909.

Atmospheric pressure: Highest, 30.36; lowest, 29.50; mean, 30.01. Temperature: Highest, 93, date, 9th; lowest, 58; date, 4th; mean of warmest day, 83; date, 9th; coldest day, 62; date, 17th; mean of maximum for the month, 78.7; mean of minimum, 64.5; absolute mean, 71.6; normal, 72.6; deficiency compared with mean of 39 years, 1.0. Warmest mean temperature of August, 77 in 1900; coldest mean, 69 in 1903. Absolute maximum and minimum of August for 39 years, 96 and 51. Average daily excess since January 1st, 1.3. Precipitation: 7.94; greatest in 24 hours, 5.05; date 16th-17th; average for August for 39 years, 4.64. Accumulated excess since January 1st, 1.15. Greatest precipitation, 10.42, in 1875; least 1.18, in 1886. Wind: Prevailing direction, northwest; total movement, 7,610 miles; average hourly velocity, 10.2; maximum velocity, 40 miles per hour. Weather: Clear days, 13; partly cloudy, 10; cloudy, 8; on which 0.01 inch or more of precipitation occurred, 9. Thunderstorms: 13th, 20th. Mean temperature of the summer, 71.83; normal, 71.90. Deficiency, 0.07. Precipitation, 13.09; normal, 12.17. Excess, 0.92.

The "Panflex" spring wheel, invented by Hon. R. C. Parsons, of turbine fame, shown in operation at the recent *conversazione* of the Royal Society, is an invention which has for its object the easy motion of a vehicle when run at low or high speeds. This ease of motion is due to the springs being capable of deflection in every direction. The wheel is exceedingly reliable, according to its distinguished inventor, and not subject to bursts or punctures, prevalent in the case of wheels fitted with pneumatic tires. The wear and tear are small, and should a spring break, which is seldom the case in practice, another can be inserted in a few minutes at a very small cost.