THE VERANT: A NEW DEVICE FOR VIEWING PHOTOGRAPHS.

BY EMILE GUARINI.

The verant is an instrument designed for the monocular examination of photographs obtained with ob-

THE "VERANT" IN USE.

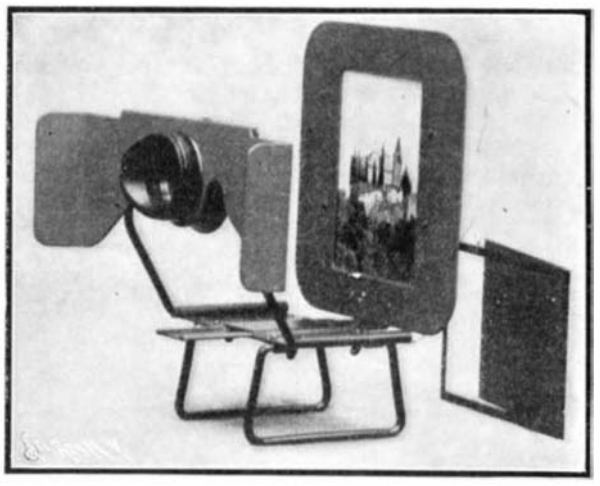
jectives of short focus. When a view has been taken with an objective of which the focal distance is appreciably less than the distance of distinct vision, that is to say, 10 inches, a long-sighted observer cannot place his eye near enough to the photograph to see the images that it represents, at the same angle at which his eye would have seen the objects themselves had it occupied the place of the objective at the moment at which the exposure was made. A uniformity of such angles might be obtained, it is true, by enlarging the first photograph; but this process, which is quite a long and troublesome one, would have the inconvenience of bringing the eye too close to the images of very distant objects (such as landscapes and buildings). The verant obviates these difficulties by furnishing a very distant visual image of the photograph, the various parts of which are shown to the eye at the same angles as those at which the objects photographed appeared to the lens of the camera. This result is obtained by means of the new achromatic lens mentioned above, which possesses the two following advantages: its focus is, with sufficient approximation, equal to that of the objective with which the view was taken, and it produces no distortion at a point situated at about an inch from the nearest lens, so that the center of rotation of the eye can be brought to this point.

The apparatus is mounted upon a special frame that permits of bringing the photograph into position at the desired distance. The base plate is provided with a handle formed of two stirrup irons that can also be used as a support when the apparatus is employed in an elevated position. Such a position is to be recommended when it is desired to examine a large number of photographs. Upon the upper part of the plate there is a slide for focusing the image, and two bent rods for the reception of the screen that carries the lens, and which can be folded up. The screen is wide, and its two sides are curved toward the observer in order to protect the unused eye from the light as far as possible. Its surface is dark and unpolished. The screen engages with the two rods by means of two spring sockets. The axis of the lens is at right angles with the center of the image when the screen is pushed back upon the rods, so that the latter touch the upper edge of the screen. The lenses are constructed in two sizes, one of them having a focus of 4.25 and the other of 5.8 inches. When the eye is well placed, these two lenses furnish an anastigmatic, achromatic image free from distortion. According to experiments, a deviation of about 15 per cent between the focus of the objective with which the view was taken and the focus of the lens of the verant is nearly imperceptible to the eye. The lens of 4.25-inch focus can consequently be used for all views taken with objectives whose foci are comprised between 3.5 and 5 inches, and that of 5.8-inch focus for views taken with objectives having a focus comprised between 5 and 6.5 inches. It is sometimes of interest, however, to use a lens of shorter focus than that required by the rule just mentioned. Although less correct, the image furnished by such a lens may prove more agreeable to the eye. The verant diminishes the importance of the foreground, and, in certain cases, an exaggerated diminution of this part of the view gives more harmonious effects.

In addition to the views, it is possible to fix in the frame a ground glass for use in examining transparencies, or a small sheet iron frame designed for unmounted views. This frame is arranged like film supports. It is constructed for 3.5 x 4.6-inch sizes, and can, at will, be shoved up or down upon the bent extremity of the rods. It is provided upon the back with a slide for the reception of the views.

In making use of the apparatus, an observer having normal eyesight sees, not the small photograph introduced into the instrument, but its distant image, and, owing to the fulfillment of the conditions enumerated above, this image is seen free from distortion, and, except for color, with exactly the aspect that the scene photographed had at the place at which the view was taken. The apparent size, the shadows, and the sharpness are faithfully rendered. The result is an impression of reality that leads the observer to a correct appreciation of the distances. He sees the photograph with its natural relief. It is necessary, however, to select the eye with which it is desired to observe, and to carefully manipulate the screen. This latter is so constructed as to assure the eye the desired position at about an inch from the surface of the lens. It must be applied closely against the eye, so that its higher part shall cover the external angle of the latter. Internally, it carries a holder, designed to receive the correcting glasses for far or near sighted persons.

After the eye has been selected, it is necessary to turn the elevated part of the screen toward the left if it be desired to make use of the left eye, and toward the right if it is the right eye that is to observe. After this, the four fingers of the left hand are inserted in the handle. Then the apparatus is placed as near as possible to the eye that is to observe, and the focusing is effected by pressing the extremity of the slide with the thumb of the hand that holds the apparatus. The operator stops when the view appears with sharpness throughout its entire extent. If one angle or one side of the view is not sharp, the center of rotation of the eye is not upon the axis of the lens, and the head must there-



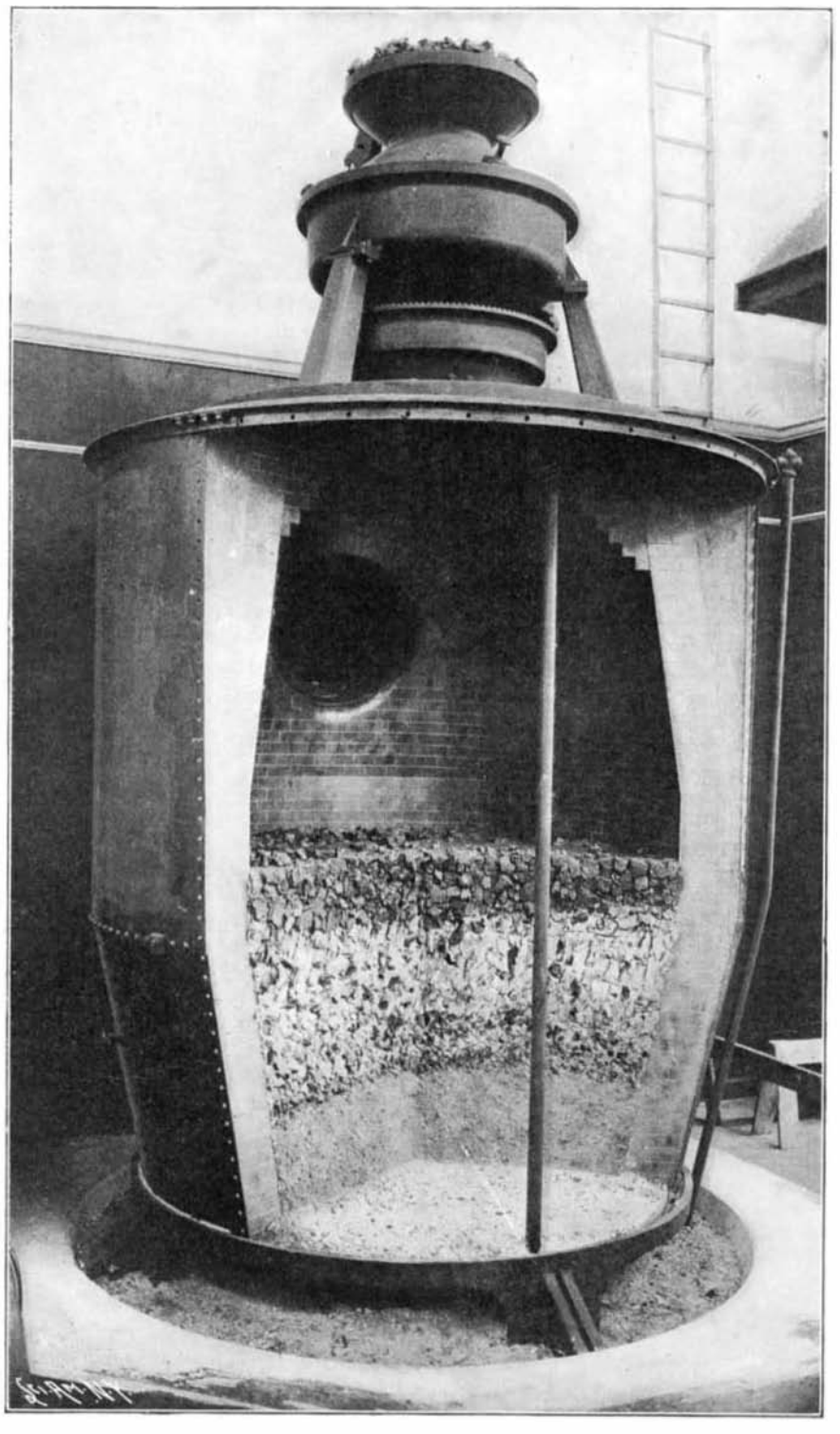
THE "VERANT."

fore be slightly moved, and, if that does not suffice, the direction of the screen must be changed.

Long and short sighted persons should, before using the apparatus, remove the screen and introduce a correcting glass into the holder intended for it. It is unnecessary to say that, under such circumstances, the lens of the verant will present the usual distortion of spectacle glasses which, however, the majority of those who wear glasses will not notice. Individuals having abnormal eyesight can also remove the screen and bring the verant as close as possible to the glasses that they use for seeing at a distance. But this method of operating has the inconvenience of not fixing the position of the eye, even approximately, and often furnishes defective images to observers who are not familiar with optical instruments. During the observation, it is necessary to give the axis of the apparatus, as nearly as possible, the same inclination upon the horizon as the objective had during the exposure. The apparatus should therefore, as a general thing, be held horizontally. This method of operating contributes toward producing an impression of reality. Upon properly inclining the apparatus, it is sometimes possible to correct the convergence of the lines of a building photographed with a camera which was not held level, but was pointed upward.

The photographs mounted upon cardboard are introduced into the frame in exactly the same way as lantern slides into a stereopticon. With unmounted views, the small sheet-iron frame is used. When the arrangement is not provided with a ground glass, one is fastened upon the back faces of the frame.

Being free from distortions and astigmatism for an apparent field exceeding 50 per cent, it is unnecessary to say that the new verant lenses are capable of being used with advantage as weak lenses or as lenses for reading. The manufacturers have even mounted some of them in appropriate frames. They are provided with an asymmetrical screen which assures the center of rotation of the eye the desired position at about an inch from the neighboring surface of the lens. Short-sighted persons must naturally here also introduce a correcting glass into the holder at the back of the screen.



MODEL OF A CONTINUOUS-FEED GAS PRODUCER AT THE ST. LOUIS FAIR.

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The construction of the Morgan producer herewith illustrated, which is exhibited in the Mines and Metallurgy Building at the St. Louis Fair, is exceedingly simple. It consists essentially of a firebrick-lined shell supported on standards in a basin of water. The lower part of the shell, which is without a bottom, is filled for about two or three feet with ashes, which stand in the water and can be easily dug away from the periphery of the basin. Upon this bed of ashes is supported a layer of coal of about the same thickness, which is maintained in the incandescent state by a blast of air driven by a Korting blower with steam jet to a point just below the

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MODEL OF A CONTINUOUS-FEED GAS PRODUCER AT THE ST. LOUIS FAIR.

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incandescent fuel. From the upper part of the producer is led away a large firebrick-lined conduit carrying away the hot gas to the furnace, or to the distributing main. On the top of the shell is mounted a cast-iron table, on the surface of which is carried a little water to protect it from destruction by the heat. Into this top is set the automatic feeding mechanism, which distributes the coal uniformly and continuously over the gas-making surface.

ACTION.—The oxygen contained in the mixed current of air and steam seizes upon the hot carbon of the fuel, and is converted into CO_2. This red-hot CO_2 passing upward through the fuel seizes another atom of carbon, and reaches the surface as CO (carbon monoxide) carrying with it the hydrogen liberated from the steam, also the nitrogen carried in by the air, and the volatile hydrocarbons contained in the coal, which are driven off merely by the heat without any chemical combination with the oxygen. The fuel is thus absorbed; the ashes which remain settle gradually downward as the under bed is dug away a little at a time. The gas comes away in immense volume, every pound of coal yielding from 65 to 75 cubic feet, but, of course, one-half of its volume is nitrogen, which does not carry any combustive energy except by reason of the fact that it is hot.

GAS FIRING.—The advantages of gas firing may be thus summarized: First, cheaper coals can be used; second, the coal is all received and handled at one point; third, the combustion in the furnace is perfect—an exceedingly important point; and fourth, most of the large waste heat of the direct-fired furnace is saved ("regenerated") and restored to the system when gas-fired. Sometimes, as in the case of melting furnaces, this feature alone means a saving of fifty per cent.

The system as a whole is very simple, and is now reduced, by means of the automatic feed, to practically a machine operation. Until the device was introduced by the Morgan Construction Company, four or five years ago, the coal was dumped intermittently in large quantities by hand upon the incandescent surface of the fuel bed. The result was an immediate rush of the rich volatile gases at lowered temperature, which brought in its train all sorts of troubles. This rush was followed by a period of lean gas formed by the slow oxidation of the carbon, mixed with hydrogen liberated from the steam.

ASHES.—The removal of the ashes and clinker has also been greatly simplified. The clinkers are formed in the hot zone of combustion by the melting of the ashes when containing iron and sulphur, but they are softened and broken by coming in contact with the steam as they gradually descend to the water basin in which the producer stands. Access is provided all round the circle with equal convenience, so that the man who tends it has no difficulty whatever in keeping the fire level just where it should be, by occasionally digging away the soft, wet ashes at the proper place.

FEEDER.—In the automatic feeding arrangement an upper coal reservoir is held stationary on standards, while a lower chamber forms an inclined spout which is slowly revolved by a ratchet motion, carrying with it a conical disk under the mouth of the upper chamber. The disk allows the coal to work through gradually as it revolves, and the revolution of the spout distributes the coal uniformly over the whole surface from center to periphery. This revolving member has to be closed against gas leakage, which is effected by the simple water-seals shown, which also serve to keep the whole apparatus cool.

The steam, in addition to its service in reducing the clinkers, is a most active agent in the gas production. Of course, in order to maintain incandescence, only a limited amount of steam can be carried in with the air supply; but that limited amount performs a most useful function. It absorbs a large proportion of the sensible heat of combustion, and is thereby broken up into its constituents, oxygen and hydrogen. The hydrogen is good gas, having the same heat energy per cubic foot as the CO; and the oxygen so freed, by combining with the carbon, diminishes to some extent the amount of air, and, consequently, the amount of inert nitrogen which has to be supplied. In other words, the more oxygen obtained from the steam, the richer the gas will be, because it will contain a less proportion of nitrogen; further, the gas is cooler, and consequently wastes less heat by radiation from the conduits.

ANALYSIS.—In a good steam-blown gas producer, automatically fed, the gas is of uniform quality, practically every minute of the day, and with an average quality of bituminous coal shows the following analysis:

CO	23 to 25 per cent.
H	19 to 17 "
CO_2	4 "
Hydrocarbons	6 "
N	48 "

Such a gas as it leaves the producer will show (including its sensible heat) about 180 heat units per cubic foot, and when properly applied will effect any metallurgical operations requiring the highest temperatures just as perfectly and economically as it will annealing or heating operations at lower temperatures.

Automobile Notes.

Three grand prizes awarded for the finest automobiles at the World's Fair were given to the Haynes-Apperson, the George N. Pierce, and the Pope Manufacturing companies for their respective exhibits. The White Sewing Machine Company received a grand prize for its exhibit of White steam cars, and the Woods Motor Vehicle Company one for electric autos.

A novel test of a 10-horse-power Oldsmobile touring car made recently consisted in coupling the machine to a 17,200-pound trolley car loaded with 51 passengers, whose aggregate weight was 6,885 pounds, thus making a total weight of over 12 tons. The automobile pulled the street car at a fair rate of speed, notwithstanding that it had to turn the heavy electric motors geared to the axles of the latter, besides hauling the extremely heavy load.

It is reported that there were no less than 22 heavy cars and 34 motor bicycles in use in the recent German army maneuvers. The cars were first concentrated at Berlin, and then followed the divisions of the army to different points. The army, however, does not possess such a great number of cars as yet, and the different constructors were called upon to fill out the number, with the understanding that the makes which proved the best during the maneuvers would be favored when it came to giving future orders for cars. Steam tractors are used for transporting different kinds of army supplies. The authorities have decided that in time of war the automobiles belonging to private individuals will be called into requisition, according to the system which now prevails in the case of horses. At present the automobile detachment of the army consists of 40 men who are in permanent employ. To this number were added 28 infantry during the whole term of the maneuvers.

The series of mechanical tests which is being made upon automobiles at the Conservatoire des Arts et Metiers in Paris this month will no doubt prove instructive in many ways. These tests are quite extensive, and the mechanical laboratories of this institution are now very well equipped for this kind of work. Different systems of transmission for automobiles will be given a thorough trial. Thus the cars will be tested as to the strains and shocks which are given to the transmission bearings, first upon a rolling flexible platform which will be sufficiently smooth to be compared to a road in good condition, and then upon a platform which contains small pieces or projections spaced at unequal intervals. These will produce a series of shocks such as the car would receive when traveling over a poor road. It is claimed that the longitudinal universally-jointed driving shaft and the chain transmission give results which are quite different according to the state of the road. As this is a question of great interest and one which has not as yet been experimented upon properly, the present tests are quite timely and will be of considerable practical value. The tests of transmission mechanism will include those made upon isolated motors, as this is indispensable in order to find the efficiency of the transmission devices. Therefore the programme will be extended, and on account of the interest which arises from comparing the different types of motors, the constructors can engage isolated motors which will be put through different tests together with their carbureter and the liquid combustible which the constructor chooses as the best adapted for the case. Besides, it seemed useful to establish a parallel between the efficiency of a car which has been in use for some time, and a new car. Accordingly, it was decided that a chauffeur could have his car tested, at the same time stating the date of purchase, the kind of usage it had, the repairs, etc. A certificate of the test will be delivered which will be of great service to a proprietor who wishes to dispose of his car. The jury is composed of prominent experts in automobile and mechanical work.

Clark Caryl Haskins, who was well known as an electrical expert and writer as well as an inventor, died recently at his home in Chicago after a somewhat prolonged illness. He was born in Buffalo, N. Y., in 1827, and in 1844 is said to have sent the first electrical message which was ever exchanged between two countries, the communication having been sent from Buffalo to Queenstown, Canada. His most notable achievement was that of evolving the multiple switchboard now generally in use for telephone purposes, and which makes it possible to operate any number of lines from the same exchange. He had resided in Chicago since 1879. His father, R. W. Haskins, was also well known in scientific circles as an authority and a writer.

Correspondence.

Two Letters on the Zebra Wolf.

To the Editor of the SCIENTIFIC AMERICAN:

In the last issue of the SCIENTIFIC AMERICAN was an article by Mr. J. Carter Beard concerning the white raccoon dog, *Nyctereutes albus* (Hornaday) and the Tasmanian wolf, *Thylacinus cynocephalus*. Speaking of the last species, he says it is "so far as the writer knows, the first animal of its kind ever seen on this side of the Atlantic." To correct a wrong impression here created, I wish you would publish a statement to the effect that there are three live specimens of the zebra wolf in the Washington National Zoological Park, one female and her two young. In the Seventh Annual Report of the New York Zoological Society (1902), Mr. Hornaday, in his Report of the Director, says of the Tasmanian wolf that "only two specimens are on exhibition in Europe, and four in America."

D. D. STREETER, JR.

Brooklyn, N. Y., October 25, 1904.

To the Editor of the SCIENTIFIC AMERICAN:

I have read with pleasure the account given in the SCIENTIFIC AMERICAN for October 22 of the "Tasmanian Wolf" in the New York Zoological Park.

You may be interested to know that the National Zoological Park also has specimens of this unusual animal, and I send herewith a pamphlet in which is given an illustration of two individuals. The mother and two young, received in September, 1902, are in excellent condition, and a male of this species has recently arrived. FRANK BAKER, Superintendent.

Washington, D. C., October 26, 1904.

The Ethiopian and His Skin.

To the Editor of the SCIENTIFIC AMERICAN:

Allow me to add one more hypothesis to the number of those which correspondents of the SCIENTIFIC AMERICAN recently made to explain the difference in pigmentation between the negro and the white man. We have now every reason to believe that both the Mediterranean and the Baltic branches of the white race are the result of the natural selection practised by a cold climate upon northward-migrating African negroes. Whatever be the cause of the amount of pigment existing in the skin of the latter, it seems to me that the decrease of it was unavoidable as soon as the race took to traveling northward. In northern countries, natural selection tends constantly to harmonize with the color of the snow that of every animal which hunts or which is hunted; why should the blondness of the northern man have a different origin? Primitive tribes were doubtless frequently decimated by hunger, as the Canadian Indians are to-day. Those hunters who show on the snow a sallow face, black hair and beard, dark eyes, worked at a disadvantage when compared with somewhat lighter-complexioned comrades. They were more conspicuous on the white field, and could not so easily approach their prey within striking distance. In time of famine, mortality was the greatest in their families. The eliminating process was repeated generation after generation, the light-complexioned individuals always leaving the larger posterity. However small may have been the difference in the mortality, we know to-day that a characteristic against which such a process is at work, always in the same direction, is doomed to disappear.

GUSTAVE MICHAUD.

Springfield, Mass., October 18, 1904.

Plants and Drought.

Mr. S. A. Skan notices in the Botanical Notes of Knowledge a paper by Prof. D. H. Campbell on the remarkable vitality exhibited by the fronds of the "gold back fern," *Gymnogramme triangularis*, which grows in the neighborhood of Stanford University, California. In the resting season the fronds of this fern do not die down, as is commonly the case in ferns, but they dry up and persist, and to all appearances are dead. However, on placing such a frond in water its freshness and activity are quickly restored by the absorption of water through its superficial cells. The prothallia of this fern are able to survive complete drying up. Some were allowed to remain perfectly dry during the whole summer of 1903, and on receiving water in the autumn produced numerous young plants. Prof. Campbell refers to certain devices in Liverworts for preventing excessive loss of water during periods of drought. In some the growing point is protected by hairs or scales, which sometimes secrete mucilage; while the life of others is continued by the development of tubers, which, being more or less subterranean, are less influenced by a dry season.

The harbor works at Gizon have been in course of construction for some years, and will take several more years to complete, though the work proceeds steadily and regularly, and when finished Gizon will be a place of considerable importance as a seaport.