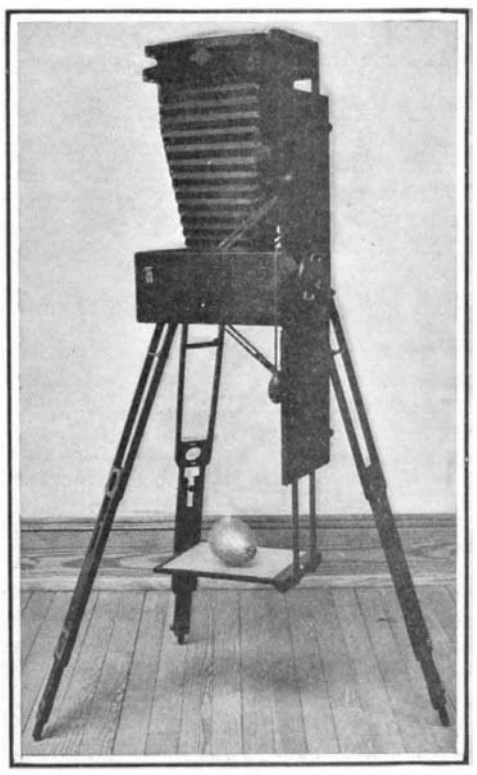
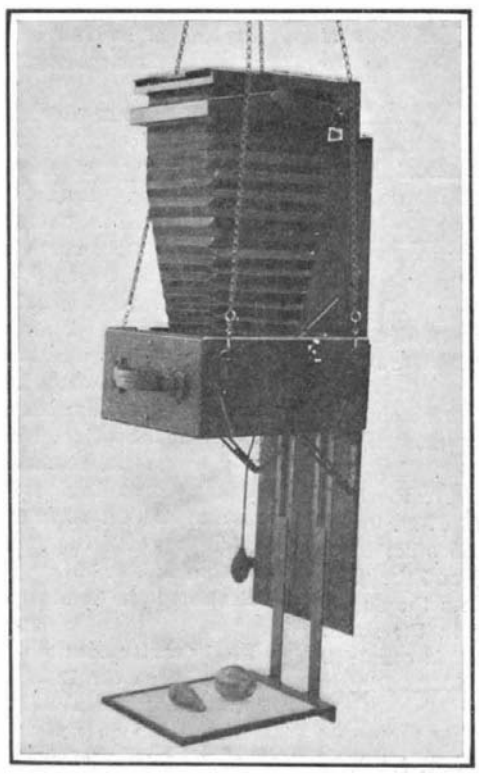
NATURAL-SIZE PHOTOGRAPHY.

BY CHARLES MONROE MANSFIELD.

The great need by scientific workers of a camera for natural-size photographs, which can be used in the field equally as well as in the laboratory, has at last been realized in the "Graphic Naturalist's Camera." This compact, many-fold camera for making natural-size photographs opens new possibilities to the collector, where the value of the field work depends largely on having the photographs made while the material is still fresh and in its natural condition. Prior to this he had to pin his specimens to a vertical surface and have them hang in an unnatural position with the background filled with distracting shadows. With this outfit the difficulties of vertical photography are overcome and now a freshly-gathered specimen can be arranged naturally on a clean white plate of ground glass and photographed in the field without shadows to mar the beauty of the picture.



Camera on Tripod.



Camera Suspended by Chains.

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Four small chains are attached to the camera in such a way that it may be suspended from the ceiling, doorway, or from a branch of a tree in a vertical position. A strong rubber band is introduced at the junction of the four chains at the point of attachment. This overcomes any vibration, which has hitherto been a drawback to long exposures which are necessary to secure good definition. With the camera so suspended, the lighting is entirely under control of the operator. The ground glass is supported directly on the camera bed, and the entire outfit may be revolved during parts of or during the entire time of exposure, thus obtaining a uniform illumination on the entire subject.

The method of gaining natural size is very simple. The camera is equipped with two scales—one on the back bed and the other on the front bed of the camera. The back of the camera is pulled out to a known point on the scale, and the front is left in place. The double track is racked out to the first reading on the front scale, which is in inches; the ground-glass base is attached to the suspended double track and the camera is in focus for the ground glass. If the subject is 3 inches in thickness the track is racked out 3 inches by the scale, and the subject is then in the right focus. The lens is then "stopped down," and the exposure made. It is not necessary to focus this camera when doing natural-size work, as by setting it at known points the natural size and focus are obtained.

When the camera is being used in the laboratory, where the light can be controlled, it may be supported on a tripod. The head of the tripod and one leg are attached to the bottom (back) of the camera; the other two legs are attached to reinforced metal supports on the inside of the front. This distributes the weight of the camera equally to all three legs, thus making it very rigid.

The camera complete weighs but nine pounds and has a focal capacity of 26 inches. It has all the features of any ordinary camera, such as rising and falling front, front and back swing, and can thus be used for general photographic work as well as for natural-size pictures. This "graphic naturalist's camera" is the invention of Mr. G. N. Collins, of Washington, D. C.

Protection Against Ants.—Too many recipes can scarcely be tried for this purpose, as many of those already in use are failures. It has been affirmed that recently hosts of these pests have been put to flight by placing in their haunts strips of paper dipped in peppermint oil.—Chemiker Zeitung.

A GIANT DREDGE.

BY OUR BERLIN CORRESPONDENT.

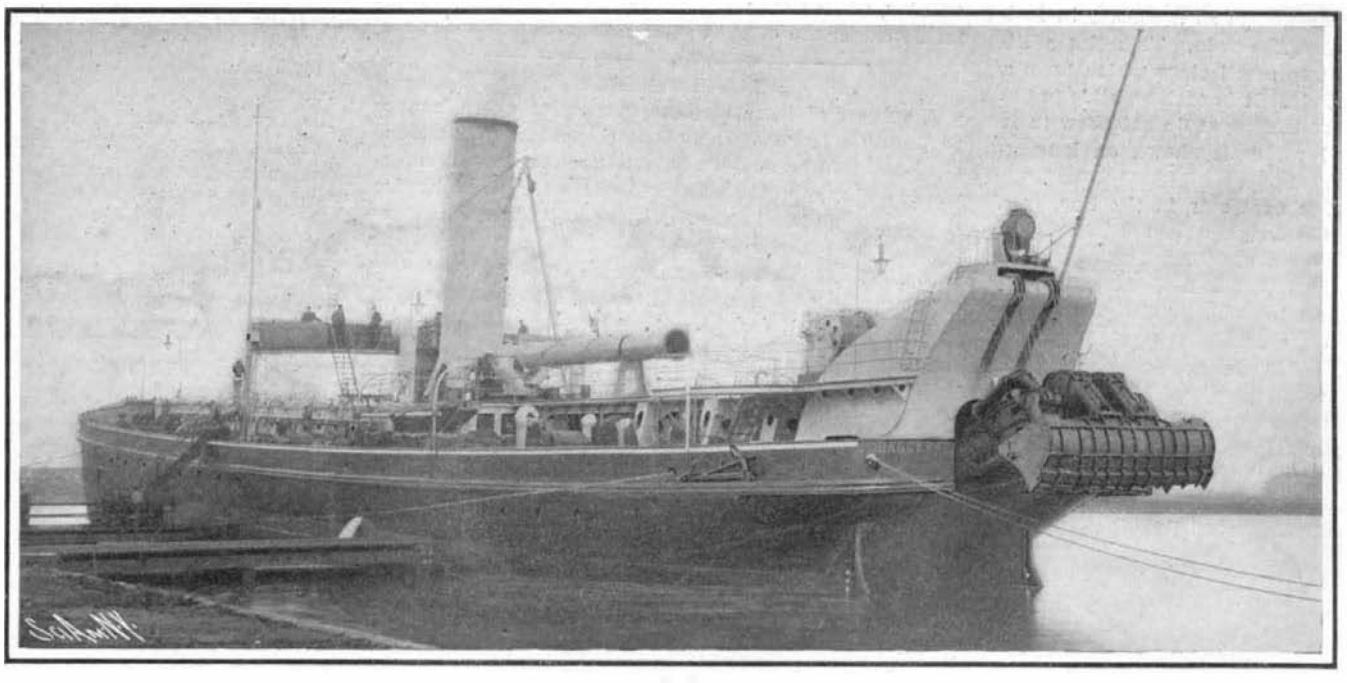
The gigantic dredge represented in the accompanying photograph has recently been completed by F. Schichau, of Elbing and Danzig, Germany, for the imperial navy, and it is intended for maintaining the channel of the Jade River at a convenient depth. The dredges available in the Prussian seaports, up to this time, had proved unable to deal with the Jade channel, which is rather shallow for the new, large-draft German liners.

This dredge, which is the biggest in the world, sailed for Wilhelmshaven after a short test of its engines made at the Danzig shipyards, and in the latter part of December rapidly accomplished its trial dredging with splendid results.

Whereas the contracts called for an hourly output of 4,680 cubic yards in soft ground, the dredge by far exceeded this figure, readily dealing with 6,500 cubic yards per hour instead of 4,680, as stipulated.

In heavy, sandy ground, of specific weight 1.96, the dredge excavated 4,680 cubic yards an hour, 65 per cent of solid ground being raised by the pressure pipes.

As regards the speed stipulated by contract, this had to be 8 knots with full load and tanks pumped full. The mean speed during a run of several hours' duration was, however, 10 knots instead of 8, showing an enormous increase in the performance of the dredge. The coal consumption was extremely favorable, being 0.85 pound per horse-power hour.



A GIANT DREDGE.

Owing to this increase in output and in speed, the dredge is able to raise and remove as much as 31,200 cubic yards of soil in one day, corresponding to a yearly output of 7,800,000 cubic yards in 250 working days.

Each cubic yard of soil raised accordingly costs less than 0.6 of a cent, including allowance for the depreciation of the dredge. This result is quite unique and much more satisfactory than any of the figures so far realized, as the harbor dredges so far known raised each cubic yard of soil at an average cost of 9.6 cents. The Schichau shipyards, we are informed, have secured contracts for a number of these novel dredges, especially for foreign harbors.

Germination and Growth of Artificial Cells.

In a recent memoir presented to the French Academy of Sciences, Prof. St. Leduc, of Nantes, gives a report of some highly interesting experiments, where the germination and growth of the natural cells was reproduced on artificial cells.

A drop of saccharose solution containing traces of potassium ferro-cyanide was introduced into a dilute solution of copper sulphate, when it became surrounded by a membrane of copper ferro-cyanide, pervious to water but impervious to sugar. The cell thus formed was quite analogous to a Traube cell, but for the fact that it possessed the faculty not only of growing but of producing extensions that were quite similar to the radicules and small rods met with in the germination of natural cells.

The physical conditions of a germinating grain in the interior of which there is at the same time a high osmotic pressure and strong cohesion were imitated. In fact, the sweetened and concentrated solution in the interior of the drop would show both a high osmotic pressure and great cohesion, the contact of the potassium ferro-cyanide with the copper sulphate producing the semi-pervious sheath. Under the influence of the difference of osmotic pressure between the drop and the liquid into which the latter was immersed, the water would penetrate through the surrounding membrane, which is impervious to sugar, thus giving rise to the growth of the cell. After a few minutes, there would spring up a bud in some point of the surface, which was surrounded immediately by a copper ferro-cyanide membrane. On the summit of this bud another bud would be produced and on this a third, and so on, each bud representing a cell and the various cells forming a row, which constituted a hollow rod, the length of which could exceed by more than ten times the diameter of the original cell. This artificial cell would absorb in its interior the substance necessary to its growth and by means of which it would produce such a voluminous body. It will be readily understood that the rod-shaped growth is due to the fact that the terminal bud has always the thinnest membrane liable to yield under the increase of osmotic pressure. Sometimes a small drop would be projected in the course of the experiments beyond the original drop, disengaging itself entirely from the latter, and this drop would likewise grow, produce buds, and give off small rods, which would also grow and finally reproduce a body similar to the one this drop had been disengaged from.

The Switzerland government has resolved to convert the whole of the railroads in the country to electric traction and tenders for carrying out the enterprise are to be invited from the most prominent electrical engineering firms. Enormous sources of generating the requisite energy are available from the abundant waterfalls, the greater proportion of which power is at present running to waste. The state railroads aggregate 1,520 miles of track, of which 242 miles are double. Although the revenue from the railroads is already considerable and lucrative to the government, it is anticipated that conversion of the railroads to electric traction will result in an increased profit.