## THE "TELEPHOT," A NOVEL APPARATUS FOR PHOTOGRAPHING AT GREAT DISTANCES.

BY DR. A. GRADENWITZ.

An interesting communication on telephotography was read before last year's Congress of Swiss Naturalists, by Mr. A. Vautier-Dufour. The author has experimented in this field for many years past, and is keenly alive to objections urged against telephotography. He has however obtained excellent results by means of a telescope, the objective of which has a focal distance as great as 2.40 m. The eyeglass was removed so that the image was formed at the focus of the objective. The author hence inferred that this process would best suit his purpose. The only drawback was the difficulty of carrying so cumbrous an apparatus about. With the assistance of the Geneva astronomer, Scheer, the problem was solved. Both constructed an apparatus with an objective 16 cm. in diameter and 2.40 m. in focal length, the latter being reduced to the third part of its value, by inserting two plane mirrors between the objective and the plate. The losses by reflection of these mirrors did not exceed 5 per cent. Exposures of 10 seconds were required when yellow screens and orthochromatical plates were used, while without a screen excellent snap shots could be taken with exposures of about 1-75 sec. The total length of the apparatus was only 3½ inches.

Vautier-Dufour is now constructing an apparatus 40 cm. in length, the diameter of the objective being 0.10 cm. and the focal length 1.20 m. It is hoped to obtain good instantaneous photographs with exposures ranging between 1-200 and 1-500 sec. The same apparatus may be used to take ordinary photographs with an objective 0.25 m. in focal distance.

The following advantages are claimed for this ingenious device, as compared with tele-objectives—greater intensity, better definition, higher magnification, and an easier adjustment. As regards the neatness of images, the views presented before the members of the congress were perfectly sharp as far as the edges of the field of view. Twelve-fold magnifications were obtained, without the apparatus ceasing to be portable.

Telephotography in its new form is likely to prove useful both for scientific and industrial purposes, as well as in warfare. The physicist will be able to photograph any phenomenon visible at the extreme horizon, such as mirages, etc., as well as those which he could not approach himself without danger, such as, for instance, volcanic eruptions. The naturalist may now safely observe wild animals and photograph them from a distance. The amateur astronomer will be in a position to take splendid views of the principal heavenly bodies. The explorer of Arctic regions will observe, by means of the "Téléphot," distant and inaccessible points. Archæologists and architects will use the apparatus to fix on the photographic plate buildings and monuments too distant to be taken with an ordinary apparatus. Military and naval officers will be able to observe and to study the movements of the enemy (the apparatus may in fact be well used as a telescope); finally, all topographical measurements will highly profit by this ingenious apparatus.

The scheme of the apparatus, as constructed by Messrs. Boissonnas & Co., Ltd., Geneva, Switzerland, is shown in the diagram. The rays emerging from the objective *A* will strike the plane mirror *B*, by which they are reflected on the second mirror *C*, to be conveyed after another reflection, to the photographical plate placed at *D*. By substituting for the long-distance objective an ordinary one (with a focal distance of 20 or 30 cm.), the apparatus may be made to serve for ordinary photographs. The "Téléphot" may, moreover, be, at a moment's notice, converted into a terrestrial or astronomical telescope.


The Telephotographic Apparatus.

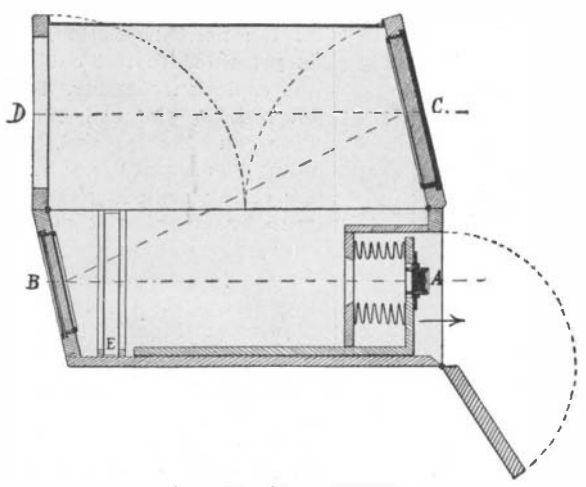


Diagram of the Apparatus.

Our illustrations show the apparatus set up for use, as well as some photographs taken with it.

## COALING WARSHIPS AT SEA.

BY HERBERT C. FYFE.

For some little time past experiments have been carried out both in British and American waters with apparatus for coaling men-of-war while steaming on the high seas.

These experiments, so far as the United States navy is concerned, have reached a practical conclusion, and the U. S. battleship "Illinois" is now completely fitted with an apparatus for taking coal at sea. She is the first warship to be completely equipped with the marine cableway, and her equipment will permit her to take coal at sea from any masted vessel. The Imperial Russian battleship "Retvizan" is also equipped with a similar installation which is giving satisfactory service.

In Great Britain the apparatus with which experiments were made consisted of a cableway fitted on the "Muriel" collier. It has had several sea tests and the results were considered highly successful. The collier delivered thirty-five to forty tons of coal per hour in a moderate sea and half a gale of wind to H. M. S. "Trafalgar," the battleship towing the other at speeds varying from eight to eleven knots per hour.

The idea of placing all the appliances for coaling at sea on a warship did not at first find favor in the eyes of many American naval officers, who argued that battleships were already overloaded with machinery and that to carry the apparatus on board would require a number of important changes in the disposition of material located in more or less essential places.

The U. S. Navy Department selected the "Illinois" for the installation and the equipment is being successfully operated. The only machines required for the warship were two special operating winches, but these were so designed that they served a double purpose and displaced two deck winches which were already on the superstructure deck of the "Illinois."

The new winches now perform all the functions of the old ones besides their own particular work, and they occupy precisely the same bed and employ the same foundation bolts as the old ones. These winches work the load carriage running between the collier and the warship. One winch draws the loaded carriage toward the warship, the other winch draws the empty carriage back to the collier.

A single wire rope ⅞-inch diameter, 2,000 feet long is employed for this purpose. Both winches run all the time in the same direction and the ropes are always taut. The reciprocating motion is given to the load carriage by the friction of one slipping drum overpowering the other. The drum of one winch is always winding in rope. The drum of the other is always paying out rope under tension of the slipping of the friction-heads. The great point about this method of operating a load carriage is that it is independent of the relative motion of the two ships. When the ships pull apart one drum slips, thus paying out the rope; when the ships approach each other, the slack given to the rope is wound in. It is of course essential that the rope speed of the winches be greater than the speed at which the ships approach each other.

The operating levers on the after bridge occupy a space of about 1⅛ square feet between two ventilators in the center of the ship, and it is here that the operator takes his stand in full view of the load carriage at all times in its passage to and from the collier.

The remainder of the equipment on the "Illinois" is to be found just below the steering compartment and beneath the platform deck. It consists of the following items: A reel suspended from the deck carries 2,000 feet of ⅞-inch diameter sea-anchor line (weight 2,640 pounds). There are also two ⅞-inch diameter conveyor lines (weight each 508 pounds) and two sea

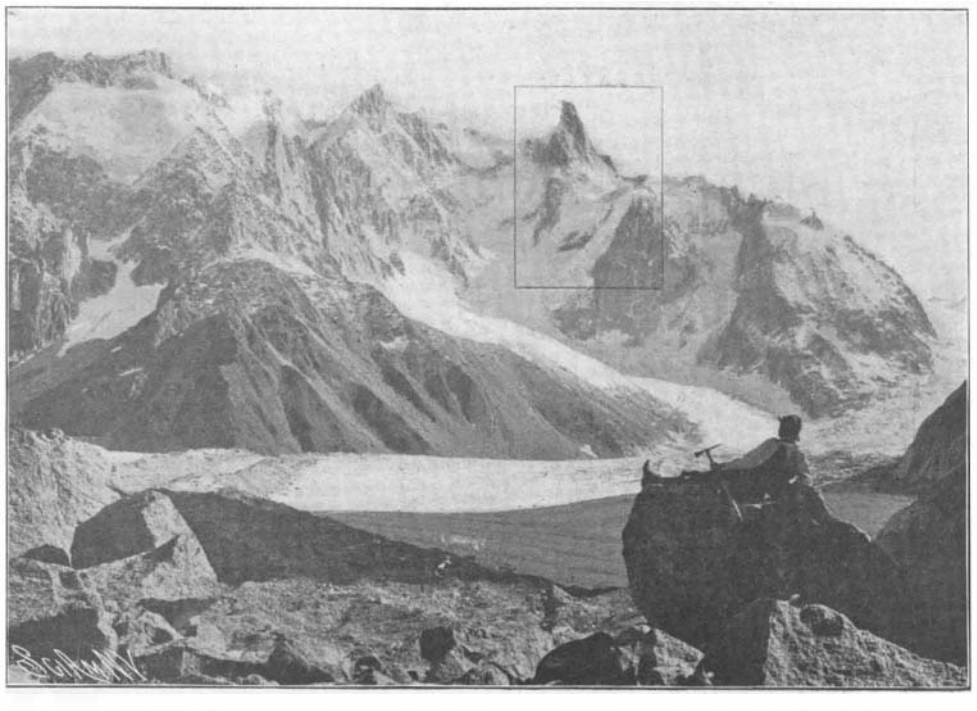

Fig. 1.—Aiguille du Geant seen from Mer de Glace (Mont Blanc.) Photograph Taken with an Ordinary Lens.

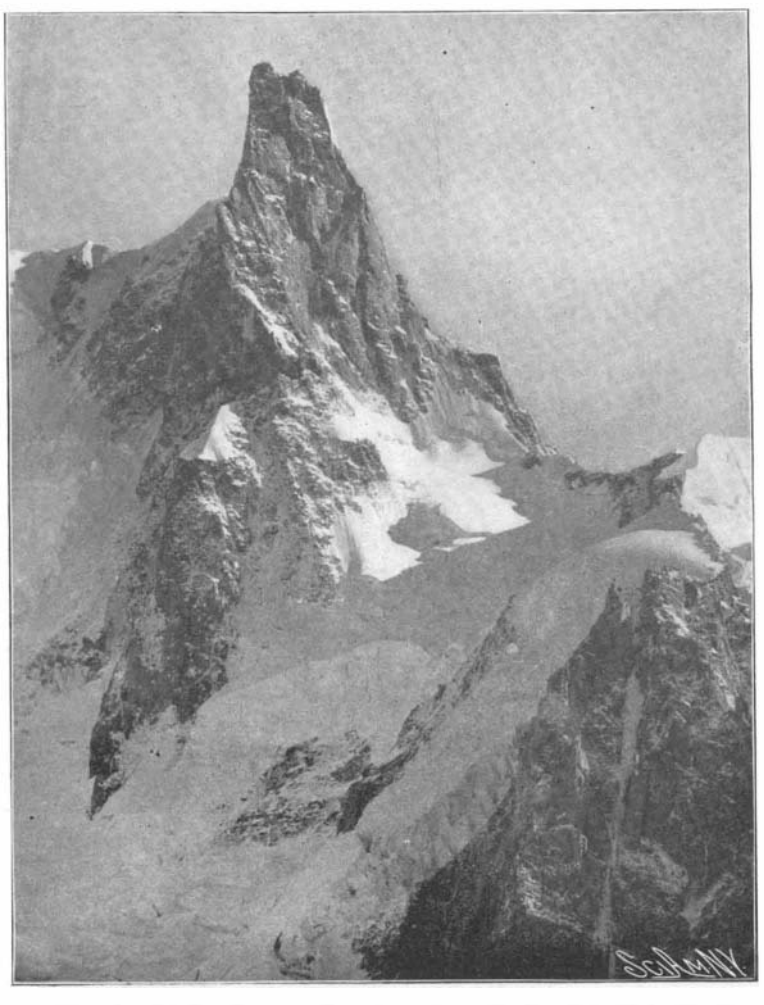

Fig. 2.—Aiguille du Geant. Telephotograph of the Peak Marked in Fig. 1, taken from Mer de Glace (Mont Blanc).

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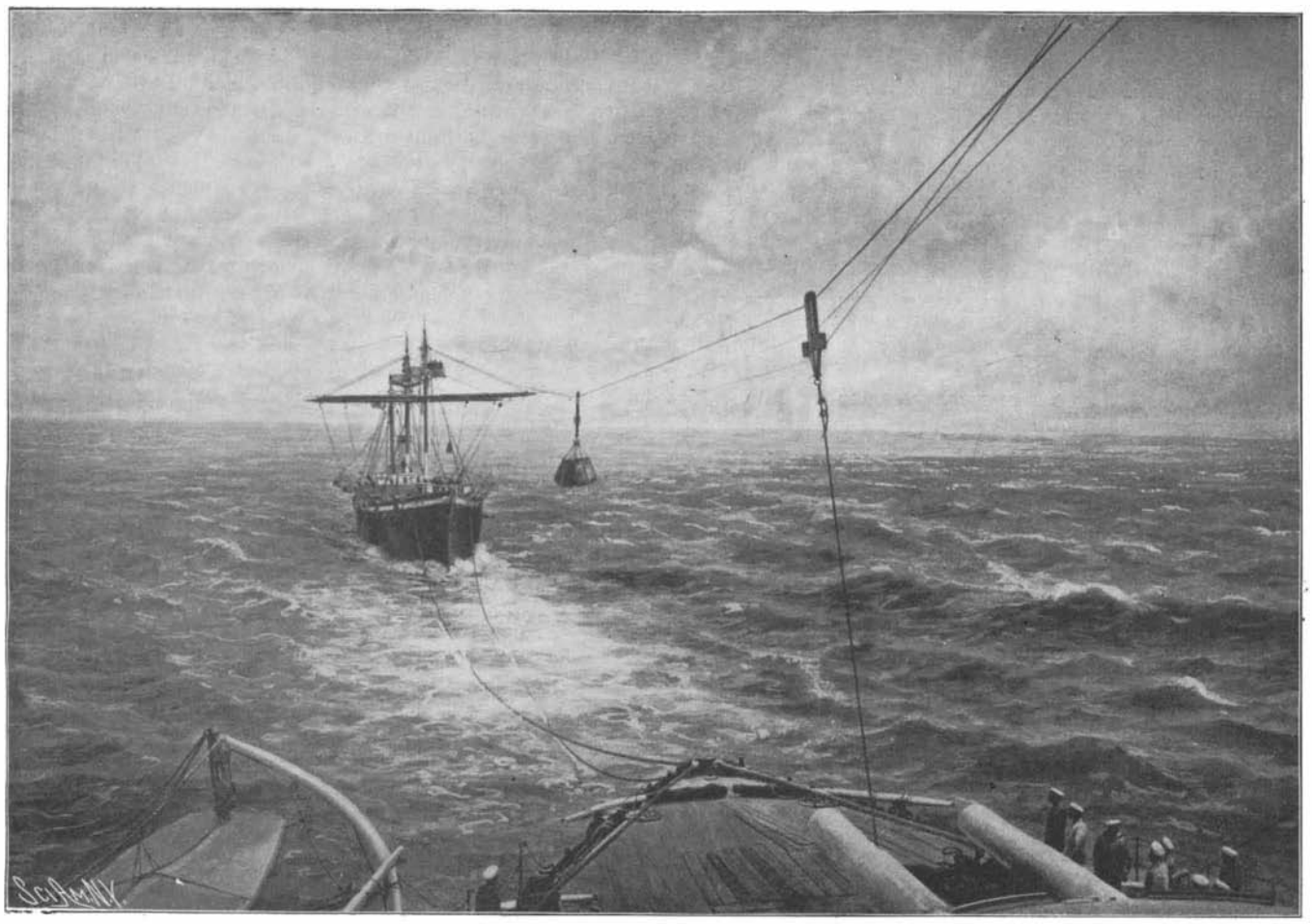
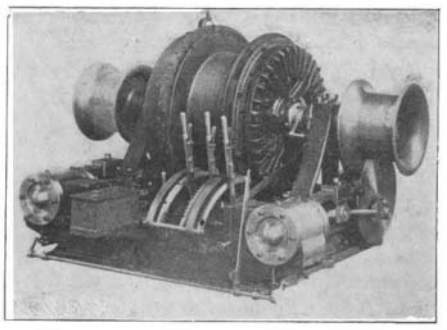
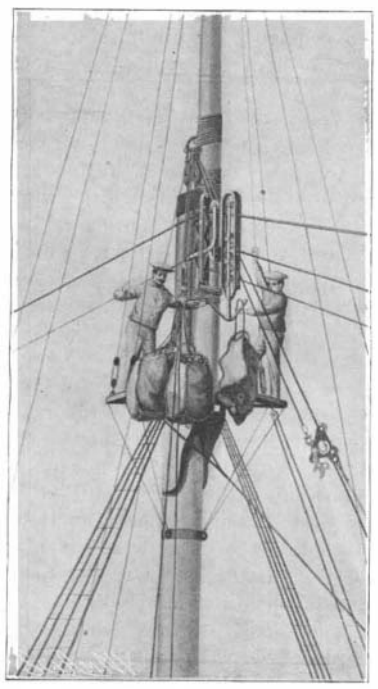


Looking Aft from a Warship Coaling from a Collier Towed Astern.

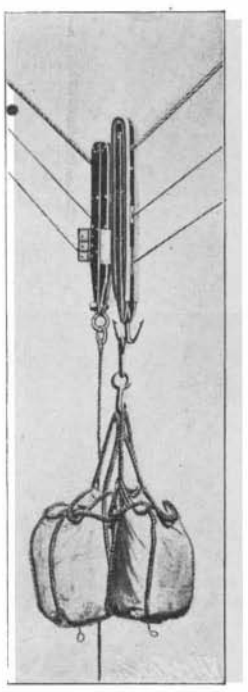
Elevating Truck Loading Bags on the Deck Ready for Hoisting to Masthead.



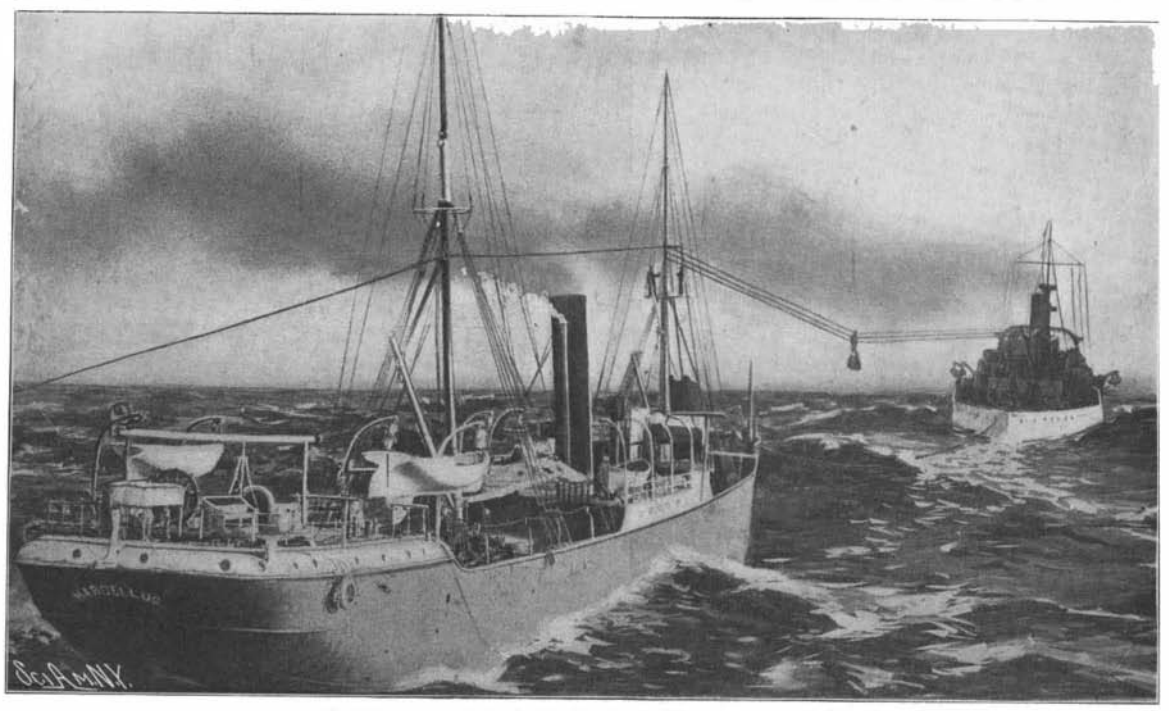
Cableway Winches on U. S. S. "Illinois."



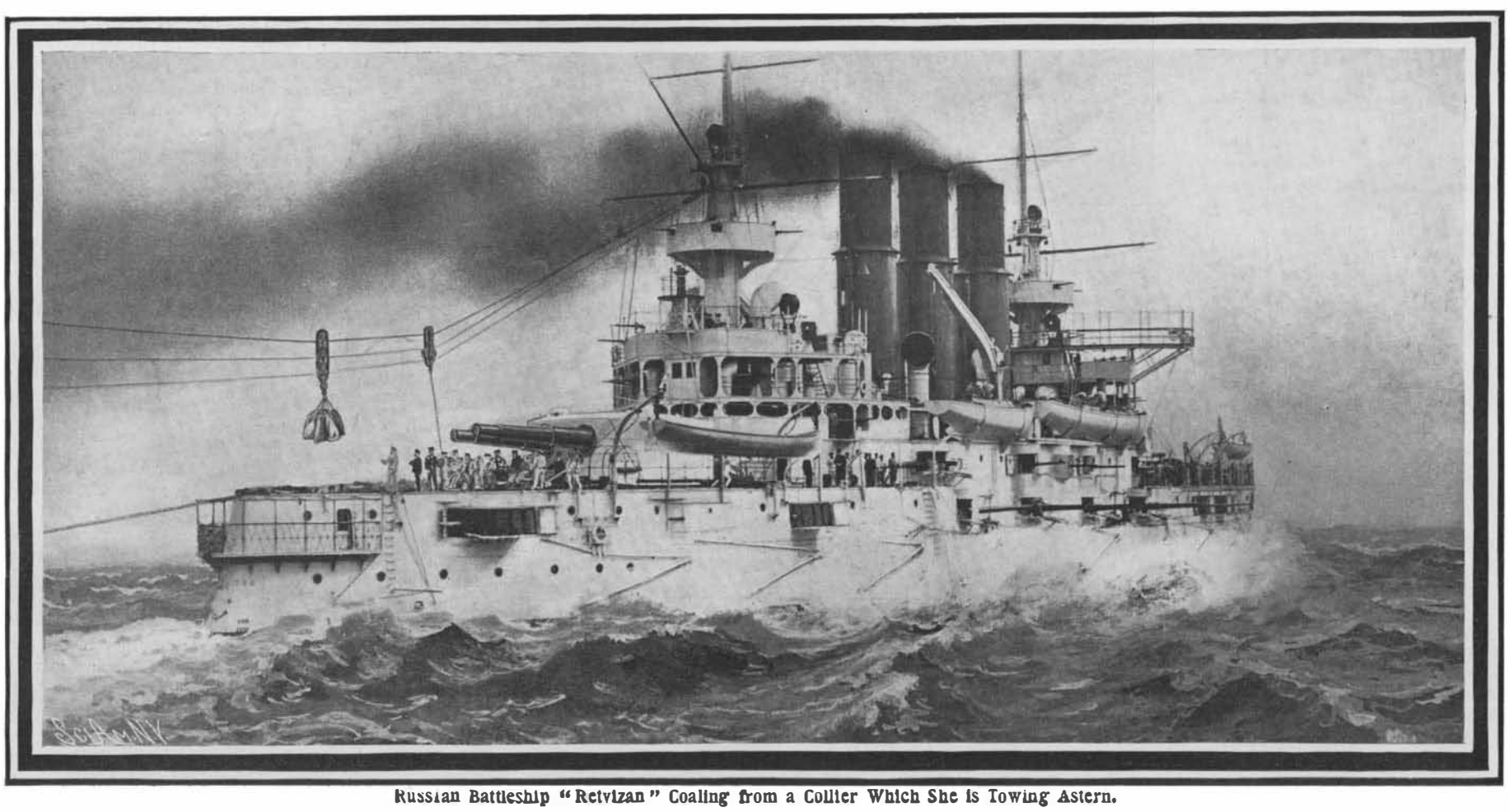
Transferring Full Coal Bags and Removing Empty Bags.



Loaded Carriage and Hauldown Block.



Collier "Marcellus" Coaling the "Massachusetts."



Russian Battleship "Retvizan" Coaling from a Collier Which She is Towing Astern.

**COALING WARSHIPS AT SEA.**

anchors. Then there are the hauldown block carriage, loading blocks, etc., all of which occupy a space just below the deck 16 feet long, 7 feet wide, and 4½ feet deep.

Several improvements have been made in the marine cableway since the early experiments between the U. S. battleship "Massachusetts" and the collier "Marcellus." The sea anchor line is now ⅞-inch diameter in place of ¾-inch as formerly, and it will easily sustain the tension due to conveying one ton of coal. The sea anchors have not been altered in any way. The coil spring (weighing 1,200 pounds) attached to the mainmast would be completely compressed under a load of 20,000 pounds, but a 12,000-pound strain is all that is required to carry a load of one ton. As the warship dips and rises in the waves, the spring will compress and elongate in uniformity with the ship's motion, and this serves to equalize the somewhat varying strain on the sea anchor. This spring as used on the "Illinois" is 8 feet long and is heavier than that used on the "Massachusetts."

The load carriage works very simply. It contains three wheels and a "grip" arranged in a vertical line. The elevating devices can be stowed away on the warship and set up on board a collier at sea in a very short time. A sheave block is lashed to the foremast and mainmast, and these support the sea anchor line and allow it to play freely through them. Just below is the tail block, about which the conveying line bends. At a point above the sea anchor line another lashing is made, and two ¾-inch wire guy ropes are there attached and led forward to the starboard and port sides of the ship, where they may be attached to the deck at almost any place found convenient.

Loads can be hoisted from the port deck and then the starboard deck, alternately, to the two men at the masthead. One of these takes in his hand the loose ring which is attached to the elevating hook. When the load carriage reaches the collier's masthead, the ring is placed by hand over the hook of the carriage, a lever is pulled on the elevating truck and the load is dropped and thus transferred to the load carriage. This operation can be accomplished in two seconds. The other man takes off the empty bags on their return from the warship, and sends them down to the deck for refilling.

In the original experiments on the U. S. S. "Massachusetts" a pair of shears was erected and guyed for the support of a large canvas chute through which the bags of coal were dropped. All of this has since been dispensed with, the ropes of the cableway being all pulled down by a nigger-head on the quarter-deck winches when it is desired to dump the load.

The improved method of delivering the coal is as follows:

The load starts out from the collier on a downhill route, continuing so for more than half the distance. When the load is just clear of the center of the span and is in its lowest position the man on the quarter-deck of the warship commences to pull down the hauldown block. By the time the bags reach the block they will be trailing on the deck. The operation now stops for an instant, the lowering continues for a foot or more, the load is unhooked from the carriage, empty bags are put on, and the whole apparatus is then raised to its normal position. At the same time the operator on the after bridge sends the empty carriage back to the collier for another load.

### The Return of the "Gauss."

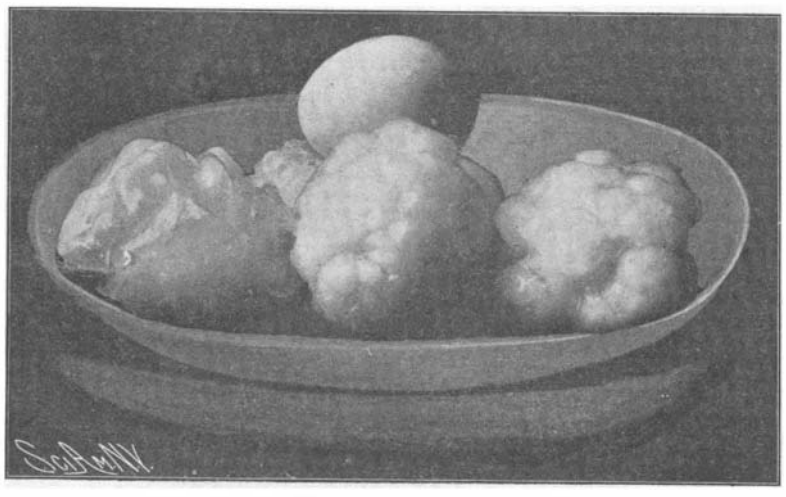
After a comparatively brief sojourn in the Antarctic regions, the German "Gauss" expedition returns with little, if anything, new to narrate. Despite the fact that provisions sufficient in amount to sustain the party for three years had been taken along, the enterprise was abandoned comparatively early. The reason is doubtless to be found in the fact that when the ship was frozen in, only a month remained before the arrival of the equinox, and with it, the long polar night. Dr. Drygalski had hoped to find winter quarters in east longitude 90 and to penetrate as far south as the 70th parallel near Termination Island. As a matter of fact, the "Gauss" never proceeded farther south than 66½ degrees south latitude. The British expedition has certainly done better, for by the last accounts Capt. Scott had attained the 82d parallel.

With the Germans out of the field, there still remain the British, Swedish, and Scottish expeditions. It remains to be seen whether they will accomplish more.

Dr. Drygalski's party, however, did not return empty-handed. Much that is new regarding ocean depths, marine flora and fauna has been gathered. Observations of auroral and magnetic phenomena were also made which will doubtless clear up many a dark spot in our limited knowledge. The exact extent and value of the exploration carried out can be determined only after a full report has been published.

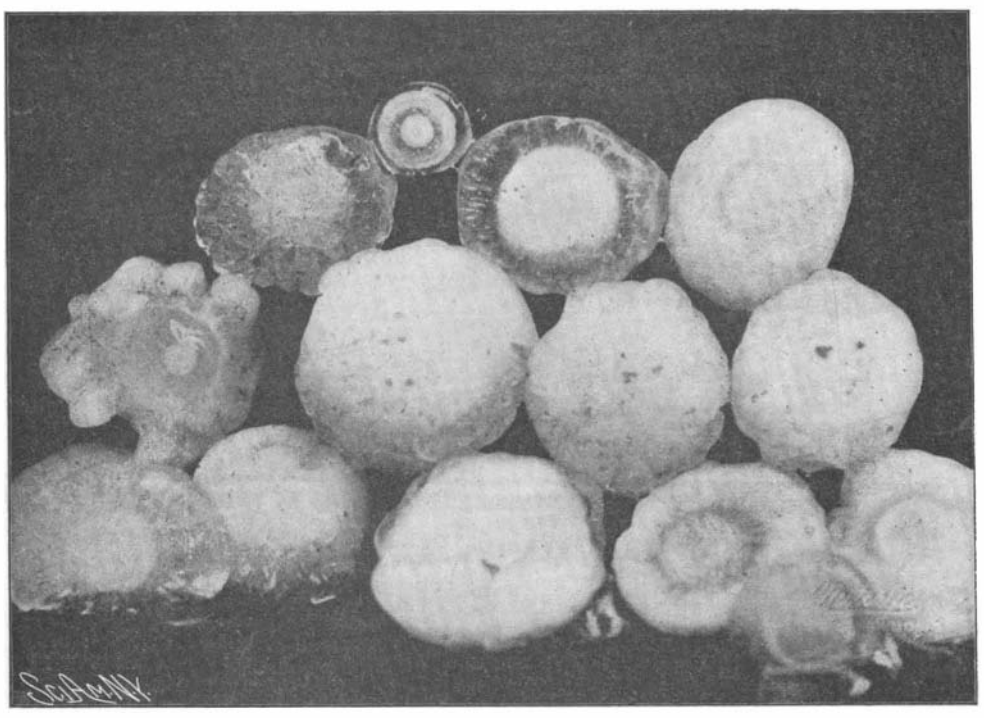
### HAILSTONES LARGER THAN HENS' EGGS.

In the vast Western States of the Union all natural phenomena are on a great scale. Rivers are wide, deep, and of enormous length; mountains are lofty and rugged, with summits clad in eternal snow; gorges, valleys and canyons are of stupendous depth; there are cyclones, tornados, blizzards, avalanches. Here are some hailstones that fell in Nebraska during a summer storm on July 2, 1900. As the photograph, which is sent by Mr. Arthur Inkersley, of San Francisco, clearly shows, the hailstones are considerably larger than the hen's egg which has been photographed on the same dish for purposes of comparison.



HAILSTONES THAT FELL AT ALLIANCE, NEB.

On Top of the Heap is a Hen's Egg.



HAILSTONES THAT FELL AT YORK, ENGLAND.

The other picture shows some hailstones which fell at York, England, on July 8, 1893. While these are evidently large stones, it is not easy to say just how large, as no well-known object has been photographed with them.

### A Disastrous Flood in the West.

Several hundred people lost their lives in a cloudburst that almost entirely destroyed Heppner, Ore., on the night of June 14. The flood came with such suddenness that the inhabitants were unable to seek places of safety. Huge bowlders weighing a ton were carried down by the current. Two-thirds of Heppner was swept away by the flood.

### Columbia University's Honorary Degrees to Scientists.

Nine honorary degrees were awarded at the recent commencement of Columbia University. Peter Cooper Hewitt and Prof. Joseph J. Thomson were made Doctors of Science. The degree of LL.D. was conferred upon Prof. Humphreys, of Stevens Institute of Technology. Peter Cooper Hewitt was presented for the degree by Prof. Michael I. Pupin.

### Raising Cotton in the West Indies.

The possibility of raising cotton on an extensive scale in the West Indies, especially Cuba and Porto Rico, has not been considered improbable, and agricultural experts who are familiar with the climate, soil, and other conditions of these islands have expressed the belief that a fair grade of the staple could be produced in abundance. A series of experiments have recently been concluded in Porto Rico which have a very important bearing on this subject, since they appear to not only prove the conclusions of the experts, but apparently demonstrate that a very high quality of the staple can be grown.

The experiments have been in progress about three years, and have been conducted by several planters from Alabama, who are conversant with the form of cultivation in the Southern States. At first a small area was planted with the seed. The results were so satisfactory that this has been increased from year to year, until in 1902 the acreage aggregated about 9,000, the cotton being grown in sixty different plats. The average production in 1902 is announced to have been about 500 pounds to the acre, or equal to one bale. As is well known, this is considerably more than the average yield in the Southern States, but perhaps the most interesting feature was its quality. Samples of it were sent to expert cotton handlers in New Orleans, Charleston, and Savannah, as well as Liverpool and Manchester. It is stated that all of the judges pronounced the staples practically as good as the product of the islands off the coast of South Carolina and Georgia, or, as it is generally termed, the Sea Island cotton—by far the best staple grown in America. The success attending the cultivation so far has determined the promoters to plant about 12,000 acres this year, and a company has been organized to construct an oil mill and fertilizer works in connection with the plantations, with the view of manufacturing the by-products from the cotton seed. Estimated by previous crops, it is calculated that in addition to the cotton itself fully 7,000 tons of seed will be secured, which, when crushed, will produce at least 250,000 gallons of oil and 5,000 tons of fertilizer. Consequently the by-products will represent in themselves an important source of revenue to the company.

So far as known, this plantation is the only one where cotton has been produced in commercial quantities in Porto Rico. Should the harvest continue to be as large in proportion to the area cultivated, however, it would appear as if an excellent opportunity were given to add this to the other resources of the island, and undoubtedly the results achieved by the company will be watched with much interest. The fact that the staple is equal to the Sea Island in fineness and length of texture is in itself of much importance, since such a small quantity of Sea Island cotton can be grown in the United States. Should Cuban planters follow the example of Porto Rico, there is apparently no reason why they should not produce an article of equally as high a standard; and with cotton added to the agricultural resources of the two islands, it might in future prove a source of wealth almost as important as that derived from coffee, tobacco, and other staples. On the Porto Rico plantation, native colored labor has been employed, as there is an abundance of this kind, but the Americans have superintended the various processes. The site of the plantation is considered to be no more favorable than many other localities, but was selected more for its shipping facilities than the fertility of the soil.

Arrangements are being made for the equipment of a large plant in England for the manufacture of the Locke sprocket chain. This is one of the first substantial acknowledgments of the American automatic machinery in that country, and as the machine represents the most perfect type of automatic action, it is being regarded with great interest at present in that country. In this machine, a tape of soft steel is fed in on one side, and it emerges at the other in the form of a perfect chain. It is then hardened and is ready for use. The Locke chain has entered into very general use in this country, having been found especially desirable in the manufacture of farming machinery. For this purpose it is used exclusively by one of the largest firms in the world, which is an American concern.