THE SEARCH LIGHT IN PHOTOGRAPHIC WORK.

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In photography, art printing, and many other similar kinds of work, it is necessary to work with surfaces illuminated as evenly and as brightly as possible. Such work is now being largely done abroad by means of projectors of the same general construction as the ordinary searchlight as to form, electric current used, and type of feeding mechanism employed, but the projectors are fitted with transverse dispersers, as indicated in the accompanying illustrations. Fig. 1 shows the method of using a projector for photographic purposes and the transverse disperser projector is noted in Fig. 2. This type of focusing arc light apparatus is constructed by the Elektricitäts-Aktien Gesellschaft, formerly known as Schuckert & Co., of Nurnberg, Germany, the celebrated searchlight electrical manufacturers.

The rays from the parabolic glass mirror, which are almost parallel, are first spread horizontally by means of an ordinary disperser of about 20 deg., with a cylindrical lens running vertically. Each lens distributes in an angle of 20 deg. the whole of the light falling upon it, causing a superposition of the images of all the lenses and effecting an equalization of the unevenness of the projector rays. In front of this a second lens is attached which distributes the light vertically on the same principle.

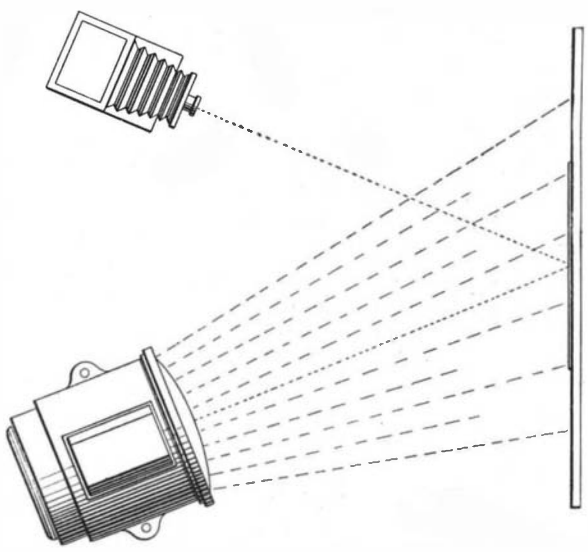


Fig. 1.—PLAN VIEW OF THE PROJECTOR IN OPERATION.

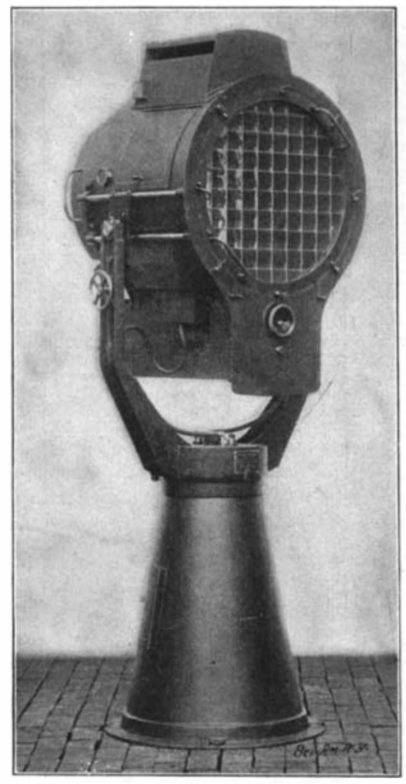


Fig. 2.—A TRANSVERSE DISPERSER PROJECTOR.

When adjusted at a maximum intensity and uniformity, the illuminated square has a width and height of 85 centimeters, with the disperser a distance of 2½ meters from the illuminated surface, the current being about 35 amperes at the focusing arc lamp. If the current is increased to 50 amperes and a somewhat larger disperser is used having a mirror of 600 millimeters in diameter instead of 450 millimeters as in the former case, the area of the illuminated square will be 88 by 88 centimeters. As the disperser is increased in distance from the illuminated surface to 3, 4 and 5 meters, the illuminated square is increased in size from 100 centimeters square to 158 centimeters square, with currents of from 35 to 50 amperes. The weight of these special projectors is from 175 kilogrammes to 290 kilogrammes, the former weight representing a disperser having a mirror 450 millimeters in diameter and the latter a disperser with a mirror 600 millimeters in diameter. Excellent results are obtained with this new apparatus, although the cost is somewhat higher than photo-engraving lamps, this class of apparatus being generally used in this country.

THE ATBARA RIVER BRIDGE.

The world-wide attention attracted by the construction and erection of the Atbara Bridge in the Soudan was due to other causes than the magnitude of the work itself. The chief of these were, first, that the bridge was urgently required in connection with the British campaign in the Soudan; second, that the work was awarded to an American firm because of its promise of shorter delivery and lower price than could be obtained from English firms; third, because, although the contract time was very short, the work was completed well within the time.

The events which led up to the awarding of this contract to an American firm are to be found in the conditions and necessities of the campaign against the Dervishes by Kitchener, whose success was due mainly to the fact that he opened a line of railway communication as he went, and was able to concentrate his forces with full supplies, etc., right in the heart of the far-distant Soudan country. In order to continue his campaign against the Dervishes, the General found it necessary to complete a railway line as far south as Khartoum, and this involved bridging the Atbara River. The place selected for the bridge is 1,100 feet wide. During part of the year the river at the site is entirely dry, but during the summer months, beginning with the latter part of June, it is a raging torrent. The army engineers having constructed a railway some distance south of the Atbara, found it beyond their power to bridge the river itself; and the British Egyptian government, on making inquiries in England early in October, found that two years were required for the construction of the bridge, the reason given being that the shops were overcrowded with work. Second tenders were then asked of two American and five British firms, speedy delivery being laid down as the chief consideration. The lowest bid was that of the Maryland Steel Company, which offered to deliver the bridge material at Liverpool at the price of 2.55 cents per pound, within four months, the next offer being that of an English firm, Horsley, which offered to deliver the material at 2.89 cents in three and a quarter months. When the tenders reached Egypt in the latter part of December, 1898, it was found that since the bidders expected to use falsework in erecting the bridge, the work could not be prosecuted until after the summer floods, which would involve the loss of a year's time. Accordingly new bids were asked, based upon the condition that no falsework should be used, and the bridge should be built by overhang, from pier to pier. The Patent Shaft and Axle Company, the only British firm which responded to the final call, offered to do the work at 3.37 cents per pound, delivering the first span in Liverpool in sixty days and the rest in three weeks, while the best American bid, that of the Pencoyd Iron Works, offered to do the work at 2.5 cents per pound, the whole of the bridge to be delivered in New York in forty-two days. The bid of the last-named company, was, of course, accepted.

PORTAL VIEW OF THE COMPLETED BRIDGE.

The Atbara structure is a single-track, narrow-gage railway bridge, composed of seven pin-connected through-spans, each 147 feet in length between centers of end pins. The width, center to center, of the trusses is 16 feet 2 inches, and the depth between chord centers is 21 feet 6 inches. The trusses, as will be seen from our illustrations, are of the ordinary Pratt type, with inclined end-posts and stiff, riveted bottom chords instead of eyebars which latter, for many years, were the prevailing practice in American bridges. The Pencoyd Iron Works, allowing two weeks for shipment to Liverpool, promised the delivery of the work in a third of the time required by the British firm, and at the same time asked a much lower price per pound for the steel. The bridge is carried upon steel cylinder piers, 8 feet 3 inches in diameter, covered by cast-iron pier-caps. The substructure was built by a Cairo firm, while the Pencoyd Iron Works designed and furnished the entire superstructure under a lump-sum contract, while they also furnished the pier-caps and the erection plant and tools under a special pound-price contract. The same company provided the extra erection force, a superintendent, two foremen and five riveters, riggers, etc. The bridge was designed to carry two engines, each weighing 181,000 pounds, followed by a uniform load of 2,240 pounds per foot. The material specified was open-hearth steel, ranging from 60,000 to 70,000 pounds ultimate strength. The plans, method of erection, etc., were worked out under the supervision of Messrs. C. C. Schneider, the Chief, and P. L. Wolfe:, the Assistant Chief Engineer.

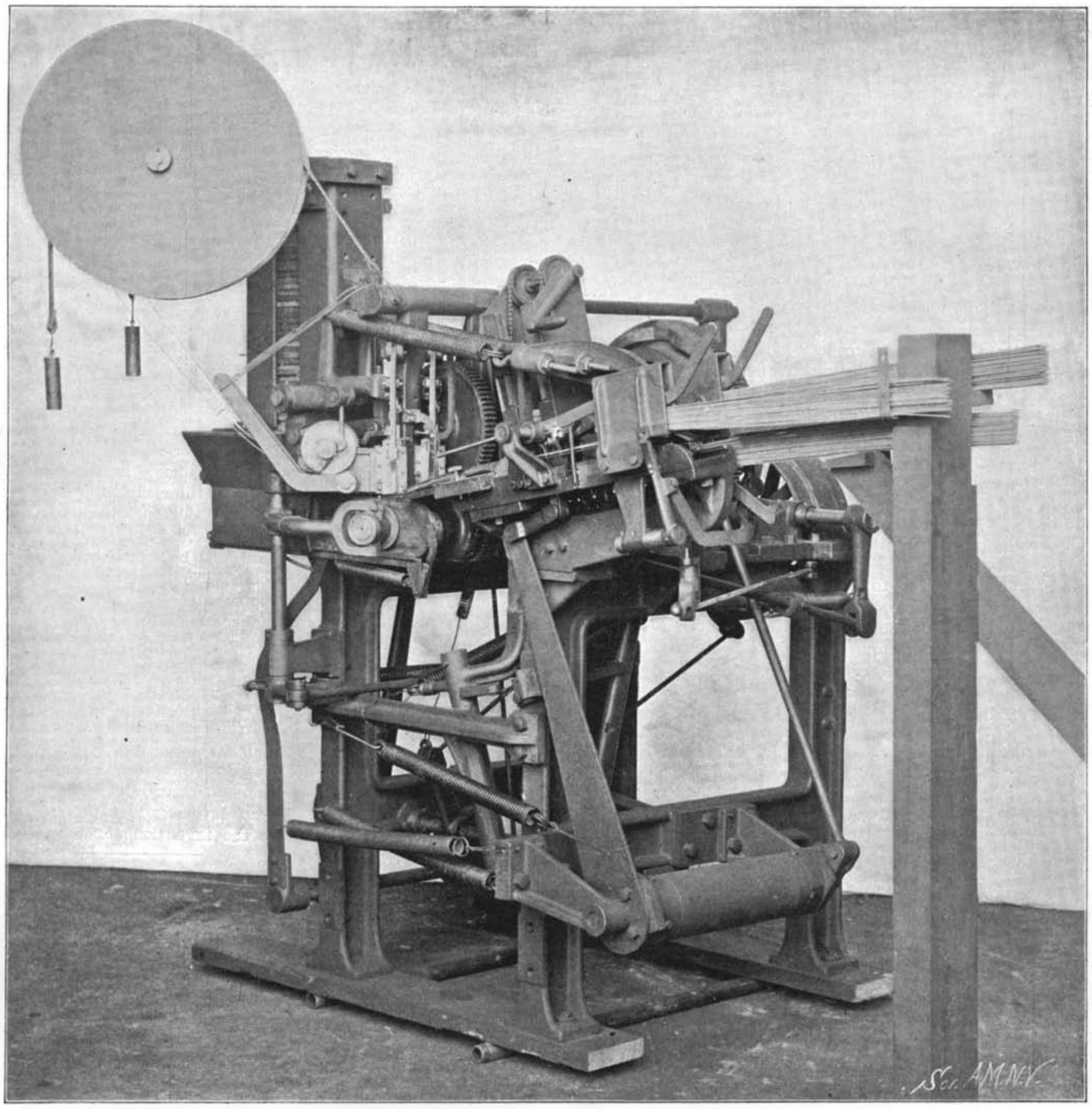
The method of erection was as follows: One span was erected temporarily on shore to serve as a holdback anchorage for the first span over the river. The inshore end of this temporary span was loaded with 60,000 pounds of steel rails; a steel traveling derrick was erected on the top chords, and a temporary connection made between the two spans to take the tension in the top chords and the compression in the bottom chords. After the connection over the pier had been made the erection proceeded continuously across the river, while the overhang method, which is customary in the erection of cantilever bridges, was used. As soon as the span had been carried far enough out to enable the booms of the traveler to reach the next pier, the cast-iron pier-caps were set, and the span was completed and thus rendered self-sustaining.

Seven 147-foot spans; total weight of superstructure, 629 tons. Order received January 20; structure shipped March 7; erection completed August 19.

ATBARA BRIDGE IN THE SOUDAN, IN COURSE OF ERECTION.

The weight of the bridge is as follows: Superstructure, 1,258,300 pounds; temporary steel work and traveler, 121,000 pounds; cast-iron pier-caps, 129,600 pounds; duplicates and extras, 4,000, making a total of 1,512,900 pounds. The account of the construction of this bridge, given after its completion by Richard Khuen, in an article before the Engineers' Club of Philadelphia, gives a categorical statement showing the extreme rapidity with which this contract was carried through. The first inquiry was received January 7; on January 13 cantilever erection was specified; three days later the statement of the maximum loading of the bridge was received, and on January 20 a quotation was sent to England. Four days later the company received the order for the bridge and the specifications. Two days later a change of the span length was ordered, and on the following day, January 27, the stress sheet was completed. In ten days the shop drawings were finished and all material ordered, and on February 6 work was started in the template and bridge shops. March 7, just a month later, the entire structure was shipped from the Pencoyd Works, in spite of the fact that seven days were lost on account of the closing of the shops during a blizzard. The entire time from receipt of final data to date of shipment was forty days, or two days within the contract time. Excluding the seven days lost on account of the blizzard, and four Sundays, we find that only twenty-nine actual working days were consumed in working out the design and details and building the structure ready for erection.

Although the designing and manufacturing of the bridge was a very rapid piece of work, it is not so difficult a feat as it was considered to be in England. The capacity of the Pencoyd Bridge shop ranges from 5,000 to 6,000 net tons per month. On the basis of 5,000 tons per month, the 750 tons comprising the whole contract represent only about four days' work for the entire shop. The erection crew left New York April 22, and reached Atbara June 16. A little over two months later, August 19, the bridge was finished; that is to say, within seven months of the date of the placing of the contract. The shortest time occupied in erecting any one span was four days. The merit of this work, considered as an engineering performance, was acknowledged by General, now Lord Kitchener, in his address at the formal opening of the bridge. He said: "The opening of this bridge is due to their [i. e., American] energy and ability and the power they possess in so marked a degree of turning out work of this magnitude in less time than it can be done by any one else. I congratulate the American foremen and workmen on the excellent success which has crowned their efforts in the erection of this bridge in the heart of Africa, far from their homes, during the hottest months of the year, and dependent solely on the labor of men speaking a foreign tongue. They have shown by their work the real grit they are made of."



MERGENTHALER GRAPE BASKET MACHINE.

Consul Bergh, of Gothenburg, writes: The Göteborgs Mekaniska Werkstads Aktiebolag, of this city, intends to build a drydock for vessels 490 feet long and of 25 feet draft, or from 6,800 to 8,000 tons displacement, and has applied to the government for subsidies. If this dock is built it may to an extent promote the establishment of direct transatlantic steamship communication. The present drydock is not large enough for ocean steamers of largest size.

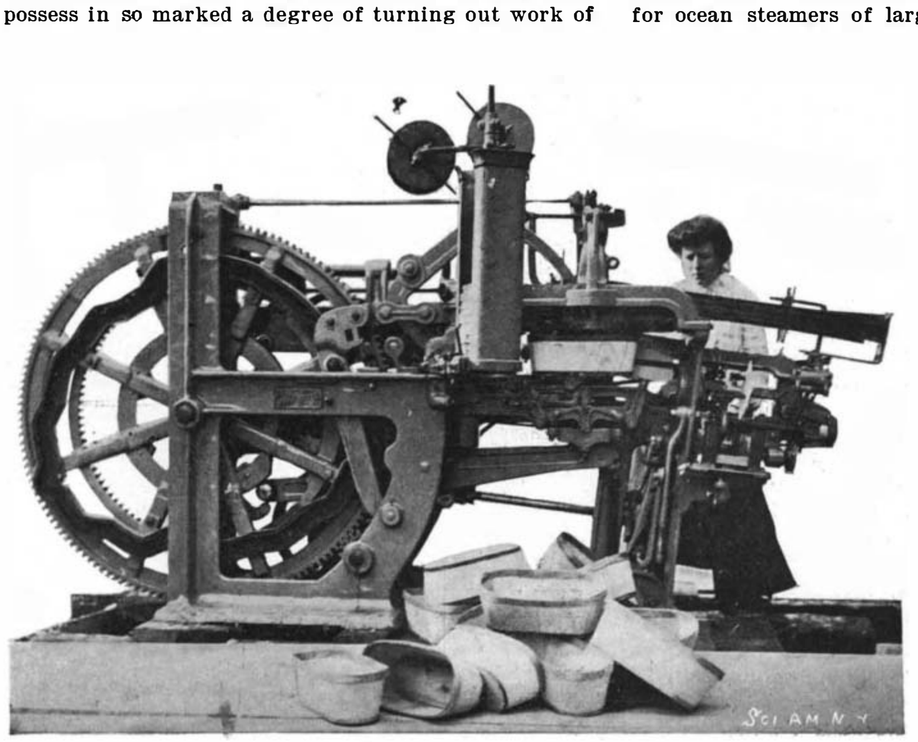
THE MERGENTHALER-HORTON BASKET-MAKING MACHINERY.

It has been one of the peculiarities of the fruit industry of the United States that the makers of baskets have found it difficult to cope with the overwhelming orders of the fruit-growers. This unfortunate peculiarity has been due primarily to the fact that all fruit-baskets used in America have been produced by hand.

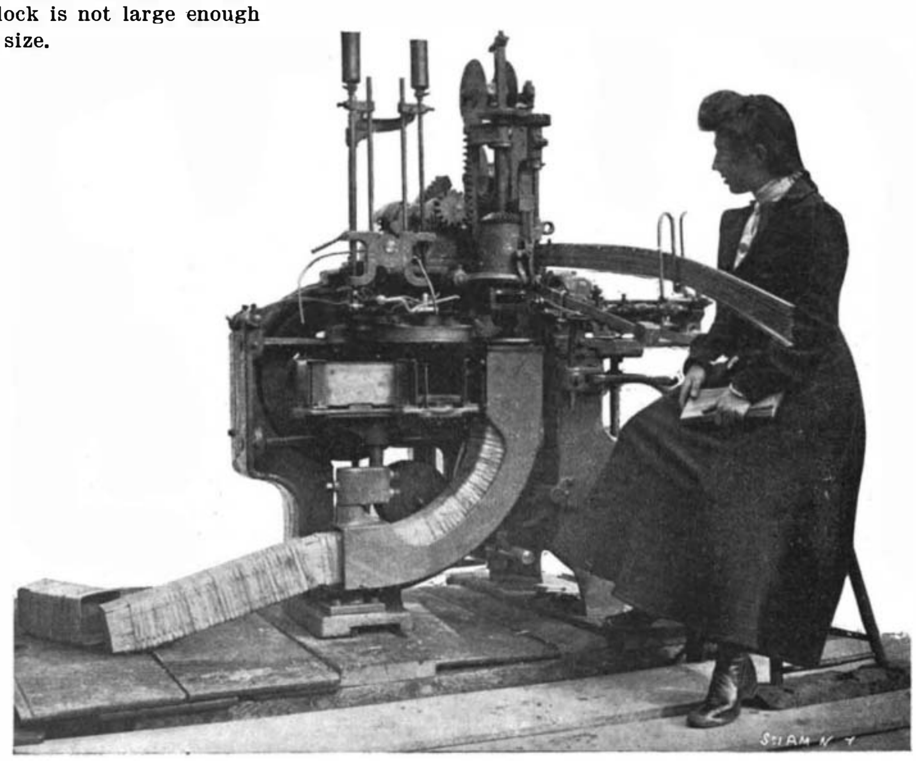
In 1894 a machine was patented by Mr. Emmet Horton, which was the first practical apparatus for the mechanical making of baskets. Horton did not stop with the invention of a solitary labor-saving device. Continuing his work, he devised improvements, simplified complex constructions, increased the operative efficiency, and at last produced a machine that could turn out more baskets in an hour than could twelve skilled basket-makers under the old system. When it is considered that the machine can be operated at a cost less than the wages of a single workman, that the baskets are produced as rapidly as they can be counted, and that they are better and stronger than those made by hand, the industrial possibilities of such a machine are evident.

In later years, Mr. Horton was associated with Ottmar Mergenthaler, whose name will ever be linked with the famous linotype machine. These two inventors produced the machines shown in our illustrations, now made by the Mergenthaler-Horton Basket Machine Company of 287 Broadway, New York city. The present article will be devoted to a general description of three types of machines now in use, two of which serve for the making of grape baskets, and the other for the making of berry baskets.

The berry-basket machine is to a very large extent the product of Mr. Horton's genius. It is a mechanical



HORTON GRAPE-BASKET MACHINE.



HORTON BERRY-BASKET MACHINE.