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SCIENTIFIC AMERICAN SUPPLEMENT

No. 623,

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THE ILLUMINATING POWER OF ARC LAMPS.

Within the last year some discussion has arisen concerning the true candle power of arc lamps. In the majority of contracts for street lighting entered into with electric light companies, the contract specifies 2,000 candle power lamps. For many years it has been understood that the lamps seen lighted upon the streets purported to be of this power. But it has been equally obvious to those who were at all experienced in photometry that they did not give anything like such a light. Their actual candle power is slightly in excess of one-third the nominal amount. The stated candle power has no more direct reference to their actual than the nominal horse power of a boiler has to its real capacity.

The subject was recently treated in a report by a well known scientist, who took the ground that, in stating electric illuminating power, two thousand nominal was to be taken as a synonym for about eight hundred actual candle power. Although this seems a rather broad generalization, it expresses the true state of affairs pretty accurately. The arc lamps are always greatly overrated.

As for the cause of the discrepancy, some engineers were uncharitable enough to ascribe it to a new system of stating the observed results. If a lamp were photometered in four directions at once, as on the cross photometer, and the results added together, then it was claimed the fictitious result given to the public would result. This would indicate a statement of a candle power four times greater than the real.

One of the leading authorities on the subject of electric lighting has recently assigned a cause for the anomaly. At the present time the ends of the carbons in arc lamps are maintained opposite to each other, and the two carbons are kept accurately in line. Hence an equal or nearly equal light is given in all directions. The first use of the arc lamp was for purposes of projection. For this purpose the carbons were kept slightly out of line with each other, so as to concentrate the light in a determined direction. The crater formed in the lower carbon faced in one direction, and in that line most of the light was emitted. At the back of the lamp the light was far less. If the same carbons were placed in alignment, a more even distribution of light would result, but it would be far less, in the ratio of 2·83 to 1, than it was in the former arrangement in the most favorable point. Thus a lamp which, with the old arrangement of carbons, would project a light of 2,000 candles in one direction, with the same carbons aligned would only give $\frac{2000}{2·83}$, or a little over seven hundred candles. The old type of lamps were photometered in the most favorable direction.

It would seem advisable that the nominal method should be changed, and that new contracts should specify lamps of so many actual candle power. This would put the whole question of supply upon a basis of fact, and would benefit both the electric light companies and the consumers who use arc lamps.

A NEWLY PATENTED MODE OF PRESERVING LIVE FISH.

An interesting and curious invention has been lately patented, which bids fair to be useful and important in the transportation of live fish. It was discovered by Mr. Walter G. Murphy, of New York City, the patentee, that fish could be kept alive for some considerable time without change of air or water by placing them in a receptacle partly filled with water, and hermetically sealing the same. To test the invention, experiments were carried on, some of them by the favor of Professor Blackford, of the New York Fish Commission, at Fulton Market, New York City. In order to make the test as thorough as possible, young fish and fish as delicate as could be obtained were used. These were striped bass. The latter to the number of about two dozen were placed in a glass jar, filled nearly to the top with water, and the jar was hermetically sealed. The fish were kept for several weeks in the jar without opening it, and did not appreciably suffer. Upon opening the jar and placing them in fresh water, they appeared as lively and well as before being placed in the jar. Another similar experiment being made, it was found after several weeks' confinement, the time being extended beyond that of the former experiment, that the deep black lines in the bass began to fade and disappear and a white fungus made its appearance on the fish, which was speedily followed by their death. Experiment with the jar *wholly* filled with water showed that the fish quickly died. Another experiment with the fish as in the first mentioned case was made, and a second jar the same as the first, with a like number of fish, and similarly filled with water, was placed beside the sealed jar. The second jar was left uncovered and the water was unchanged. The fish in the closed jar were apparently as well as ever at the end of three weeks. The fish in the open jar all died within forty-eight hours. While changes of temperature were known to be a serious question as affecting the conditions of keeping fish alive, and while the changes of heat and cold, to which the jar and contents were unavoidably subjected, could not be well regulated, yet the fish in the closed jar were not affected thereby. Experiments were also tried in which the air in the jar containing the water and fish was compressed, and it was found that the fish were benefited thereby. It would appear from the above mentioned experiments that grown fish and hardy fish could be transported from one distant locality to another with little trouble and expense, and that in the case of deep-sea fish compression of the air would aid in effecting the result. The advantage to sportsmen in carrying live bait would seem to be great, and the value to the U. S. Fish Commission to be inestimable almost, in view of the great expense now incurred in building special cars and apparatus to transport and keep fish alive. The scientific reason for the result of this invention has not been explained. The late Professor Baird, of the United States Fish Commission, when the invention was brought to his attention, suggested that by reason of hermetically sealing the jar, water did not undergo the rapid change that took place when the jar was left open, and which bred a parasite which destroyed the fish. Whatever be the reason, it would seem that the invention was one of great benefit and value, and that while the fish so treated will eventually die if not taken out after a certain time, yet practically, for the purpose of transporting fish alive, the result attained is a complete success.

SURVEY OF THE ROUTE FOR THE NICARAGUA CANAL.

On Wednesday, November 30, the steamer Hondo sailed for Greytown, Nicaragua, carrying with her a party of engineers who are to make the surveys for the Nicaragua canal. They were accompanied down the bay by an excursion steamer, carrying many well-known representatives of the two countries.

In 1884 an attempt was made to negotiate a treaty with the United States government for the construction of the canal, but it fell through. The Nicaraguan government then opened negotiations with Mr. A. G. Menocal as representative of the Nicaragua Canal Association of New York. The result of the negotiations was the formation of a contract between the two parties. Nicaragua confers upon the canal association the exclusive right of way and other privileges. In addition to these concessions, the present contract required on the part of the American company the fulfillment of certain pecuniary obligations within sixty days of its signing. This placed the contract at once on a business basis. The obligations were duly met, and the present company of engineers are to execute the first field work and perform the final survey.

The chief engineer of the company is Mr. A. G. Menocal, Civil Engineer, U. S. A. The party that sailed on the Hondo is under command of Mr. R. E. Peary, C. E., the chief assistant. It includes eighteen engineers and an equal number of assistants and a surgeon. The party are to locate the route definitely, and it is expected that they will execute the final surveys. A large body of workmen are to accompany them.

The country has already been pretty thoroughly explored by the officers of the U. S. navy. Based upon the knowledge already possessed, a long letter of instructions was prepared for the guidance of the survey. Two general plans are to be examined. Both are identical for the greater part of the route, utilizing the Lake of Nicaragua and San Juan River. The divergence occurs between the lake and the northern shore. Both routes follow the San Juan River until within about fifty miles of the coast. From this point one route goes in a nearly straight line to Greytown, while the other diverging follows a line about eleven miles greater in length. The short or so-called upper route will be awarded the preference in the surveys, although the capabilities of both will be determined.

The production of a good harbor at Greytown is considered one of the most important engineering works in connection with the enterprise. On reaching Nicaragua, a hydrographic survey is to be at once commenced, to determine the capabilities of the harbor and the best way of dealing with the sand bars. Owing to the tides, to wave action, and possibly to river sediment, the harbor has of late years become much deteriorated. The principal cause is considered to be the transportation of sand from east to west by the waves striking the coast obliquely. To determine the extent of the deposits made in a given time, two hydrographic surveys are to be executed, one at the beginning and the other at the end of operations. The changes in the bottom in the interval will disclose the amount of drift and deposit in a given time. A southward littoral current has been reported, and this is to be carefully investigated, to ascertain if it cannot be utilized as a factor in preserving the harbor. The San Juan River is to be gauged, and the inner harbor is to be sounded. All these data will indicate the amount of dredging to be done and the general system of jetties or breakwaters that may be needed to secure an available harbor on the Atlantic side.

The land surveying parties, in five divisions, are to carefully survey the ground and determine the axis of the canal. Then an exact survey of the canal line, including cross sections, level points, location of slope