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Contents.

(Illustrated articles are marked with an asterisk.)

Table listing various articles such as 'Air brake hose coupling, valve', 'Athens, British excavations at', 'Bacteria, soil', etc., with corresponding page numbers.

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Table listing sections I through XIV, including 'AGRICULTURE', 'ARCHAEOLOGY', 'BIOGRAPHY', 'CIVIL ENGINEERING', 'HORTICULTURE', 'MEDICAL AND HYGIENE', 'MISCELLANEOUS', 'NATURAL HISTORY', 'NAVY ENGINEERING', 'PHYSICS', 'RAILROAD ENGINEERING', 'STATISTICS', and 'TRAVEL AND EXPLORATION'.

OUR FIFTIETH ANNIVERSARY PRIZE ESSAY COMPETITION.

Though it is doubtless well known to the majority of our readers that the SCIENTIFIC AMERICAN ranks as one of the oldest journals in the United States, they may not be aware that it has now been making its appearance, week by week, without interruption for a period of half a century.

We feel that it is due at once to our readers and to ourselves to make some special commemoration of so interesting an event as the fiftieth anniversary of the formation of the present firm, and we have decided that this shall take the form of a profusely illustrated special number, which will be issued on July 25 of this year.

It has been the aim of the SCIENTIFIC AMERICAN to keep the public faithfully informed, week by week, of the world's current progress in the arts and sciences; and it is our intention to devote the anniversary number to a review of this progress during the past half century.

One of the most interesting features of the issue will be the publication of a prize essay on the subject of "The Progress of Invention during the Past Fifty Years," for which we are offering a premium of two hundred and fifty dollars.

The conditions governing this competition will be found on another page, from which it will be seen that all manuscript should be received at this office on or before June 20, 1896. The papers will be passed on by a select jury of three, whose names will be announced in a later issue.

We also draw attention to the arrangements which we have made to secure a vote upon the question as to what invention introduced within the past fifty years has conferred the greatest benefit upon mankind. The result in any case will be of special interest, and particularly so if, as we hope, the majority of all of our large body of readers and subscribers will express their opinion.

MODERN STEAMSHIPS AND NAVIGATION.

The modern steamship is a favorite subject for exemplifying modern progress. In early days man dreaded the ocean, and the cruise of Ulysses along the shores of the Mediterranean and Æneas' voyage with its constant landings are records of the old time coasting navigation.

In all its appliances arranged to be operated on the unstable platform supplied by a steamship in a gale of wind, the seagoing steamship embodies some of the greatest triumphs of modern engineering and science. Yet in spite of this the unavoidable weaknesses and imperfections of the service go to prove how well founded was man's dread of the sea.

The ingenuity of the inventor has done much to ameliorate these conditions. Gas buoys float upon the waves, and, charged with compressed gas, give a brilliant light for three months or more without any attendance.

The modern lightship is no longer an almost helpless hulk, whose only safety is in her anchors. She is a well built ship, with steam or power signaling plant, and perhaps with steam propelling engine to bring her to port if her cables give away.

ing recently been adopted in the patrolling of hard beaches. The almost romantic history of the inventor Francis and his metallic lifeboat and the accounts of the many rockets and mortars devised for carrying lines to wrecked ships go to show what the inventor has done to save life and property from wrecked ships.

In lighthouses proper, the advance from the old reflecting light with candles as illuminants to the modern lantern with Fresnel lenses, with a four-wick oil lantern, Wigham gas burner, or electric arc light, giving an illuminating power of hundreds of thousands of candle power, tells what science and invention have done to avert disasters.

This work, all of which may be termed shore work, is really a concession to the imperfections of navigation. The problem of safety at sea should be attacked on the ship itself. The unsinkable ship, whose engines cannot be totally disabled, has not yet been invented.

The first thing that impresses a novice who takes the tiller in a boat for the first time is the extreme difficulty of keeping a moving vessel upon a fixed course. He finds that unceasing attention and constant changes of the rudder are required. The tiller cannot be held in one position for more than a few seconds at a time. On the modern liner the same thing holds. The power the helmsman can exert by the steam steering gear is instant in effect and ample in amount, but is not sufficient in either factor to enable him to hold the ship upon a constant course.

A single degree of deflection on a radius of five hundred feet, taken as the ship's length, represents a deviation of nearly eight feet from the course. An error of one degree for an hour's run would give a deviation of nearly 2,000 feet, and for the day of over four miles. But a degree on the compass card is very little. A point, the regular unit of the compass card, is eleven and a quarter degrees, and many a ship yaws from side to side over an arc of two points, giving a length deviation of eighty or ninety feet.

The utility of dead reckoning received a startling illustration in the stranding of the St. Paul. A few days of fog put her miles south of her proper position and far ahead of her reckoning.

The most prominent improvement in modern steamships develops a new imperfection. Twin screws are now almost universal in the more modern types of first-class ships. In the old single screw system trouble was experienced from the screw lifting out of water as the ship pitched.

The rolling interferes with the direction of motion of the ship, as it changes the relative propelling power of the two screws. The ship is pushed first to one side and then to the other, the total of the propelling force is reduced and the constant shiftings of the rudder also go to impair her speed.