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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 990.

For the Week Ending December 22, 1894.

Price 10 cents. For sale by all newsdealers.

PROF. S. P. LANGLEY'S FLYING MACHINE.

Experiments with Prof. Langley's flying machine have been in progress for some time past, a long series of private trials having been conducted at Quantico, near Washington, D. C. An aluminum body contains the steam boiler and engine by which the machine is driven. The motive power is a pair of screws or propeller wheels at the rear of the body. These are rotated at very high speed and exert the entire propelling power. There are four aeroplanes, with a maximum width of eight feet. The entire spread is comprised within an area of eight by twelve feet. To direct its course to right or left there is a vertical rudder, and the setting of the wings determines its changes of elevation or of angle of ascent and descent.

It is unnecessary to say that everything about it is constructed to secure the utmost perfection of operation and lightness. Many trials have been conducted, and, at last, the possibility of flight has been proved. A trial of the machine was made on December 13, and the aeroplane successfully accomplished a flight of three hundred yards. This was not the first flight.

This, in connection with Maxim's work, goes far to indicate the possibility that we may yet see a successful aeroplane flying machine. We hope soon to have particulars of the further trial trips.

THE HUDSON RIVER BRIDGE.

The insular situation of New York is one which is destined in the course of time to make it a city of bridges. The East River between New York and Brooklyn has been spanned, and already work is in progress on a second bridge. But the great Hudson River is intact. An unfinished tunnel running part way under its bed marks the only actual attempt to break down its barrier. Over its surface a vast population is transported every day by ferryboats. The mouth of the Hudson is at New York City, and a most curious fact is that for many miles of the final portion of its course the narrowest part of the river is at the city, Castle Point, Hoboken, N. J., and Fourteenth Street, New York, marking the ends of the shortest line which can be drawn across it within a very long distance.

Various companies have been organized to bridge the Hudson River, and we have illustrated the proposed structures. The construction of long span bridges has settled definitely into two types, the cantilever and the suspension systems. The beautiful Brooklyn Bridge over the East River, between Brooklyn and this city, illustrates the perfection of the suspension type, a type which always produces a graceful structure, the suspension cables tracing an approximate parabola in midair. The Forth Bridge is a monument of the gigantic and the ugly, the disproportion between its cantilevers and connecting trusses being primarily responsible for its appearance.

It crosses the Firth of Forth at Queensferry, in Scotland, and has two main openings of 1,710 feet span each. It is to be hoped that no structure of this sort will be built here. It would be a pity if the harbor of New York, with the Statue of Liberty and the Brooklyn Bridge, both objects of absolute beauty, were to have such an infliction as the Forth Bridge. Fortunately the action of the Secretary of War seems to prohibit it for the present at least, as will be seen below.

The Hudson River, as a navigable stream, is under federal control as far as legislation is concerned. The decision of the Secretary of War in the matter of the construction of a bridge over the Hudson River has been published within the last few days. It was elicited by the application for permission to build a cantilever bridge across the stream by the New York and New Jersey Bridge Company, the charter of the company providing that their plans must be approved by the Secretary of War. The main point of the decision is that the secretary forbids the construction of any bridge except one of single span.

We have illustrated two plans of bridges proposed for the purpose in question. One, the great Lilliendahl suspension bridge (SCIENTIFIC AMERICAN, May 23, 1891), was designed for a span of 2,920 feet, enough to go clear across the water. The other, a cantilever construction (SCIENTIFIC AMERICAN, June 16, 1894), with a maximum span of 2,020 feet, requires a pier in the stream. The latter feature the Secretary of War has decided to prohibit. This decision follows an exhaustive investigation of the subject made by a board of engineers appointed for the consideration of the question of the construction of the bridge.

The reports state that a single span bridge of either of the above types is safe. The distance between bearings is put at 3,100 feet. A cantilever of this span would cost twice as much as the 2,000 foot one, while a suspension bridge of the larger span would cost but one-third more than the smaller cantilever. A sum of $23,000,000 is estimated as sufficient for a six track suspension bridge. The gist of the decision is that it will be a suspension bridge or nothing.

There has long been a species of rivalry between engineers, and even nations, involved in the magnitude of bridges. For a while the United States, with the East River Bridge, led the world; now Great Britain, with its Forth Bridge, is in the van. When we have a 3,200 foot bridge crossing the Hudson River, we shall probably retain for many a year a proud pre-eminence in this branch of engineering.

When we consider that for the above enormous sum of money six or seven tunnels could be built under the river bed, which would be superior in their operations to a bridge, as they would distribute trains with their passengers along a considerable frontage of the river, and which would be more quickly finished and put in operation, it seems a wrong system to try to raise capital for the construction of the gigantic bridge, destined perhaps never to pay a dividend. Already a tunnel has been carried two-thirds of the distance across the river. If this should be finished and put in operation, the bridge might be relegated to future generations—it might be postponed until the bridge across the British Channel is commenced.

Soft Caps on Conical Projectiles.

It has been proved recently that the penetrating power of conical projectiles may be greatly increased by covering their ends with caps of soft metal. The discovery is one of great importance to naval engineers. It has long been known that hard metal projectiles are likely to be shattered on striking a plate of hard steel, thereby losing much of their force. Great efforts have consequently been made for years to provide the hardest possible surface for armor plates for the purpose of shattering the shots fired at it. The present discovery, it will be seen, will probably work a revolution in such methods.

The idea of capping the projectiles was suggested by the discovery that if a thin sheet of soft wrought iron be laid over a steel-faced armor plate, the latter failed to shatter a chilled steel projectile which had been fired at it with great force. A similar combination was effected by adding the soft metal to the head of the projectile instead of to the steel armor plate. In the subsequent experiments (which were carried out in Russia) the capped projectile was found to penetrate plates against which the best Holtzer shot was completely shattered. The caps were tried on a 6 inch conical projectile, and it was found that the most effective plan was to cover the 6 inch conical projectile with a cap 4½ inches long, having a thickness of ½ inch at the apex and ⅛ inch at the edges. It is probable that the good results obtained were due largely to the lateral support given to the hardened point by the soft metal thimble. It is suggested that the so-called Russian "magnetic" shot, concerning which there has been so much mystery, is merely a form of capped projectile. Similar experiments have been recently carried out at the United States naval proving ground at Indian Head, Maryland, with the same result.

A Forest Buried by Alluvial Deposits.

A remarkable instance of the rapid formation of alluvial deposits from overloaded streams has been discovered by the government geological expedition on the Yahtse River, in Alaska. This river in its course from the Chaix Hills to the sea passes through a tunnel in the Malaspina glacier, some 6 or 8 miles in length. When it finally emerges into the open air it is a very swiftly flowing stream of dark muddy water, 100 feet wide and about 20 feet in depth. Near the point where the river emerges from the ice it flows through a forest of large trees, and the gravel and sand carried along by the stream are deposited here to the depth of many feet. Some of the tallest trees still project through the deposit and retain their branches. The greater part, however, have been broken off and completely covered up by the sand. In other places the presence of vast forests is indicated by a few dead branches projecting through the deposits. In places where the deposits are thickest all signs of the trees have disappeared and in their place nothing may be seen but broad sand flats. These are inundated in stormy weather, and are of about the consistency of quicksand.

Distribution of Game in the State of Maine.

An interesting report on the distribution of wild game in the State of Maine has been made recently by the State Fish and Game Commissioners. A remarkable increase of large game, such as moose, caribou, and deers, is reported. The number of those who hunt this game has, however, increased fully twenty-five per cent during the year. The ruffled grouse, which are still quite plentiful, are being rapidly decimated, and this is true for the most part of other forms of small game. Fish culture as applied to land-locked salmon has been very successful. Some forty fine lakes and ponds were stocked with these fish during the year. The value of fish and game interests to the State is estimated at from $3,000,000 to $4,000,000. The commission ask for an appropriation of $30,000 per annum for the next two years for carrying on the propagation of fish and game. They also request that the State be thoroughly supplied with wardens to protect the game.