Scientific American.

ESTABLISHED 1845.

MUNN & CO., - - - EDITORS AND PROPRIETORS.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, - - NEW YORK.

TERMS TO SUBSCRIBERS.

One copy, one year, for the United States, Canada, or Mexico $3.00
One copy, one year, to any foreign country, postage prepaid, £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845) ..... $3.00 a year.
Scientific American Supplement (Established 1876) ..... 5.00 "
Scientific American Building Edition (Established 1885) ..... 2.50 "
Scientific American Export Edition (Established 1878) ..... 3.00 "

The combined subscription rates and rates to foreign countries will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner Franklin Street, New York.

NEW YORK, SATURDAY, NOVEMBER 19, 1898.

FACT AND FANCY.

Mr. Nikola Tesla, of New York, has invented what is known in naval science as a dirigible torpedo, that is to say, a torpedo which, instead of being self-driven and self-steering, like the Whitehead and the Howell, now in use in our navy, is driven and steered by an operator on shore, who controls the torpedo through electrical connections. Of the latter kind are the Sims-Edison, the Brennan, and the Victoria.

The Sims-Edison torpedo is driven by an electric motor carried within the shell of the torpedo, and it is steered by exciting certain magnets which control the steering gear. Current for operating the motor and magnets is supplied through a flexible cable which is wound upon a reel carried within the shell of the torpedo, and has one end connected to the shore. As the torpedo travels through the water, the cable unwinds. The torpedo is maintained at the proper depth by attaching it to a canoe-shaped float. To enable the operator to follow the course of the torpedo, two small flagstaffs are carried at each end of the float, and by keeping his eye on these, the operator is supposed to be able to steer the deadly weapon unerringly on its course. By night two colored lights are carried at the ends of the flagstaffs, and are hooded in such a way that, while they are visible to the operator, they are invisible to the enemy.

The Victoria, an Australian invention, differs from the last-mentioned in being entirely submergible below the water and in using compressed air as its motive power. When first started, it hauls a cable after it, unwinding it off a reel on shore, and the first part of its course is covered at moderate speed. When the operator has guided it to within striking distance of the enemy, a current is sent through the cable, which releases the reel on the torpedo and allows its cable to unwind. At the same time the current starts the air engines at full speed, and the final dash for the ship is made. The Brennan is another torpedo of the dirigible type, which received considerable attention as the result of its being taken up by the British Admiralty and subjected to exhaustive experiments. Like all the torpedoes of the dirigible type, however, it has proved to be only moderately successful, and, in common with them, is not regarded with much favor by naval authorities, the Whitehead automobile being par excellence the torpedo of the present day.

The most characteristic feature in Mr. Tesla's torpedo as distinguished from the others of the dirigible class is that, whereas they use a connecting cable for transmitting the controlling power to the torpedo, he makes use of the Hertzian waves, dispensing with the cable. This method of transmission is more popularly known under the name of "wireless telegraphy," and as such attracted considerable public attention during the recent experiments by the British Post Office with the apparatus designed by the young Italian, Marconi. On another page we reproduce some of the drawings accompanying the patent which has recently been granted to Mr. Tesla, and these, together with the descriptive matter, will render this interesting device clear to our readers.

Regarding the merits of the invention and its practical value, it is altogether too early to make any predictions. The abolition of the connecting cables is, of course, greatly to be desired, and the Tesla torpedo will, presumably, be rid of the liability to accident due to several thousand yards of cable trailing in the water. On the other hand, since the propelling current can no longer be transmitted from the shore, it becomes necessary to provide batteries within the torpedo itself, thereby adding again the weight that was saved by abolishing the cable.

It is true the range of the torpedo is enlarged (according to the inventor, indefinitely); but as the Sims-Edison has an extreme range of two miles, at which distance it would be extremely difficult to follow the motion of the two small flagstaffs above referred to, we fail to see what advantages would ensue from being able to drive and control the torpedo at any greater distance.

Except so far as it dispenses with the cables, it is not evident what advantages the Tesla torpedo possesses over others of the dirigible type, and unless it proves far more effective in actual test than they have done, it cannot be considered as even a formidable weapon.

Unfortunately for its reception by the thinking public, Mr. Tesla's improvement has been introduced to the world with some of the most extravagant rhapsodies that ever threw discredit upon an untried invention. Under the "scare head" title "Tesla declares he will abolish war," one of the leading New York journals quotes Mr. Tesla as saying in an interview: "War will cease to be possible when all the world knows to-morrow that the most feeble of the nations can supply itself immediately with a weapon which will render its coast secure and its ports impregnable to the assaults of the united armadas of the world. Battleships will cease to be built, and the mightiest armorclads and the most tremendous artillery afloat will be of no more use than so much scrap iron. And this irresistible power can be exerted at any distance by an agency of so delicate, so impalpable, a quality that I feel that I am justified in predicting that the time will come, incredible as it may seem, when it can be called into action by the mere exercise of the human will."

Having thus oratorically blotted out the navies of the world, the interviewed descends to particulars, and the reader, whose faith in battleships and cruisers is thus so rudely assailed, is relieved to learn that the mighty agent of this naval cataclysm is no more nor less than our time-honored friend the torpedo (that ever verdant topic of the universal destructionalist); in new war paint and snorting strange and new defiance, it is true, but still—"a torpedo." Unlike its prosaic forbears, however, this prodigy is not content with smiting anything in the way of a warship that may be in sight; for so keen is it on the scent that it could strike, we are told, a vessel that lay at Southampton, England, while the operator was snugly ensconced in the forts at Sandy Hook.

"Mr. Tesla told me," says the reporter, "that some months had elapsed since he had fully developed his device, for which he has applied for a patent. When it was learned that Admiral Cervera was bottled up at Santiago, it was his intention to apply his mechanism to several launches and similar small craft loaded with high explosives and annihilate the fleet at anchor. Admiral Cervera, however, came out and met his fate under the guns of the American fleet before the necessary arrangements could be made. Then Mr. Tesla planned a raid on the Spanish vessels in Havana Harbor, only to be thwarted by the proclamation of the suspension of hostilities."

In view of these facts we can well believe the inventor when, according to the journal in question, he says of his dirigible torpedo:

"My imagination fairly reels when I attempt to contemplate its countless possibilities. Already I hear the knell of the battleship and the monster gun! . . . England is now no stronger than the weakest of the maritime nations. . . . She will be utterly confounded, . . . and France will rejoice."

Now all this extravaganza may or may not express the true state of the "reeling imagination" above referred to. We prefer, charitably, to hope it does not; but the question to be asked in all seriousness is, What possible good can be done either to the inventor himself or to the great cause of science, which he is presumably desirous to promote, by confusing the minds of the public by such unscientific exaggerations as we have quoted above?

The facts of Mr. Tesla's invention are creditable enough in themselves. Their practical value will be demonstrated, we presume, in due course under the fierce searchlight of a test by naval experts. Until that time it would be better to allow the navies of the world to enjoy to the full that short spell of life which yet remains to them.

GIANT STEAMSHIPS FOR THE ATLANTIC SERVICE.

The modern tendency toward centralization is very manifest in the ever increasing size of the steamships, both freight and passenger, built for the Atlantic service. It seems but a few months since we were recording the truly enormous dimensions of the "Pennsylvania," of the Hamburg-American line, yet in the brief interim she has been succeeded by a sister ship, while others rivaling her in size are upon the stocks or projected. The same company is building for the New York service a vessel that will exceed the "Pennsylvania" (which, by the way, is credited with having carried over 14,000 tons of freight in her hold on a single trip) in every point of comparison. A special feature of her construction will be the fact that the cellular construction known as the double bottom will in this ship be carried up into the sides, giving her practically two complete hulls. This will greatly increase her chances of surviving a collision by providing her with a more elaborate watertight subdivision. Two other large freight steamers are under construction for the New York service of this company and several for the Baltimore and Philadelphia and the West Indian and East African service.

The most interesting of the new vessels, however, is the passenger steamer "Deutschland," which is under construction by the Vulcan Company, of Stettin, the builders of the "Kaiser Wilhelm der Grosse." She is to exceed the latter vessel in size and speed, and with the exception of the "Oceanic," which is shortly to be launched at Belfast, she will be the largest steamship in the world. Her dimensions are: Length, 685 feet; beam, 66½ feet; depth of hold, 45 feet; tonnage, 16,000; horse power, 33,000; and sea speed, 23 knots. Including the "Oceanic" and "Deutschland," the four largest steamships will be the "Oceanic," "Deutschland," "Kaiser Wilhelm," and "Campania." Below we give a comparison of these with the "Great Eastern":

	Tonnage.	Length.	Beam.	Horse Power.
"Great Eastern"	22,500	680	83½	7,650
"Oceanic"	17,000	704	?	?
"Deutschland"	16,000	685	66½	33,000
"Kaiser Wilhelm"	14,000	649	66	30,000
"Campania"	12,950	620	65	30,000

The "Deutschland" is to be completed in the spring of 1900, in time for the heavy travel in connection with the Paris Exposition.

BOILER CAPACITY IN AMERICAN AND ENGLISH LOCOMOTIVES.

The constantly increasing weight of the express trains on English railroads of late years has necessitated the designing of much more powerful engines to cope with the situation. During the past two or three years, particularly, the English designers have been enlarging the dimensions of their locomotives up to the full limit allowed by the small size of their tunnels and by the other constructional features in the way of bridges and station platforms which impose a serious limit upon the dimensions of locomotives and cars in that country. Anyone who follows with interest locomotive development in this country and England must have been struck with the great disparity in size and power between the locomotives in use in the two countries. There is nothing in England to compare with our heaviest ten-wheel express locomotives or with such gigantic freight locomotives as those which have recently been built for the Great Northern Railroad, the Philadelphia Railroad, and the huge 115-ton engine turned out by the Pittsburg Locomotive Works.

It must be admitted, however that even after making allowance for the cramped condition of tunnels, bridges, etc., English engineers have been slow to avail themselves of such opportunities as they had. It has been a common occurrence, and is, indeed, a common occurrence on some lines to-day, for the heavy trains to be hauled by two comparatively light engines under circumstances where a single engine of greater power could have been designed to do the same work with a considerable saving in the expenses of operation. There are many express engines in constant service in England to-day whose heating surface is barely one thousand square feet. In America, trains such as these engines are hauling would be handled by a locomotive of between fifteen hundred and two thousand square feet of heating surface and having cylinder capacity in proportion.

For some reason or other, the English have been slow to increase the size and power of their boilers. The diameter of the cylinders and the stroke have been increased without any corresponding provision being made for a larger supply of steam, with the result that to American eyes many of the English express locomotives look to be very much over-cylindered. Of course, this disparity is somewhat corrected by the fact that the coal burnt on English locomotives is, as a rule, of better quality than ours, and there is, moreover, a certain amount of benefit derived from the copper fireboxes, which are universal over there, and the brass tubes, which, we believe, are still very widely in use.

Another cause which has operated to keep down the size of the boiler is the partiality of English engineers for large driving wheels, coupled with their prejudice against placing the boiler at any great height above the rails. On engines, for instance, like the celebrated eight-foot single drivers of the Great Northern Railway, the diameter of the boilers is restricted to the distance between the drivers, and hence it is impossible to largely increase the heating surface as long as the boiler is kept well down upon the frames without extending it to a length which is not desirable.

In America the tendency to increase the size of the boiler in express locomotives showed itself at about the time when we were also greatly increasing the size of the driving wheels. The difficulty was met by boldly placing the center line of the boiler well up above the wheels, allowing the boiler, if need be, to overlap them considerably. A notable instance of this was the New York Central engine, No. 999, in which the center of the boiler is 8 feet 11½ inches above the rails. Experience has proved that this arrangement presents no objectionable features, and, indeed, it is found that a locomotive with a high center of gravity