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COULD A HOSTILE FLEET BOMBARD NEW YORK?

In these days of modern ordnance, when rifled guns can send missiles weighing nearly a ton to distances never contemplated at the time when most of our harbor defense systems were projected, the question cannot fail to arise: Is New York safe from bombardment by a hostile fleet? England, France, Germany, or Italy, could concentrate a dozen heavy iron clads off Sandy Hook within three weeks of a declaration of war, and as we have absolutely no ships whatever to meet them at sea, we should have to depend upon our coast defenses and torpedoes for protection. Are our defenses sufficient to save our sea-coast cities from bombardment?

In view of the enormous ranges obtained by Herr Krupp with his new rifled breech-loading guns, the question also arises whether New York could not be shelled from the open sea, where the enemy would be far beyond the effective range of our forts. In the first place, how far can shells be thrown? For the purpose of bombarding a city it is unimportant that the aim should be accurate. New York could be terribly injured by any kind of stray firing, irrespective of the enemy's capacity to single out particular buildings as targets. But the Krupp guns have shown an extraordinary accuracy at long ranges. The 3½ and 4½ inch guns have given accurate results as high as 9,057 yards, the lateral deviation at this distance being less than 60 yards. Their extreme range, so far as any records have been made public, has not exceeded 11,000 meters, about 11,900 yards, or 6·8 miles. But it is claimed that the larger guns, from 8 inches to 15·75 inches in calibre, will give a much greater range. During our civil war General Gillmore threw shells from a 300 lb. Parrott gun into Charleston, a distance of eight miles. At the Centennial Exhibition in Philadelphia, Herr Krupp exhibited a 12-inch gun bearing the modest inscription: "Range 15 English miles." Probably it is allowable to stretch the truth at an International Exhibition, and so it is not unreasonable to allow ten miles as the outside limit of this gun's range. But Krupp's latest gun, 15·75 inches caliber, throwing a solid shot of 1,760 lb. weight, may very likely exceed even ten miles. In like manner the famous 100-ton guns furnished to the Italian government by Sir William Armstrong may have a range proportionate to their immense size, in which case 12 miles would not be an extravagant estimate for them.

Now let us examine the chart of the sea coast around New York Bay. There are three channels from the open sea to the Narrows. The main entrance passes close under the guns of an unfinished fort on Sandy Hook. The channel is deep and comparatively constant in depth. The Swash channel is about two miles from the Sandy Hook fort, and, at low tide, its depth will not permit the entrance of a vessel drawing more than 24 feet. The third channel is far distant from the fort, but it has a depth of only 14 feet. Now, while every effort would be made, by using torpedoes and other obstructions, to close the main and Swash channels against an enemy's fleet, it is not impossible that an entrance should be effected. Since torpedoes are available only when covered by heavy fire from guns on shore or on shipboard, the ships could proceed, in comparative safety, after passing Sandy Hook, until they approached Forts Hamilton and Wadsworth at the Narrows. The fort at Sandy Hook is only half begun, and it is of old and almost obsolete character, and therefore in the event of a hastily declared war it would not be likely to afford much protection. Hence the probability of a fleet passing has been considered; but it is far different at the Narrows. Without going into the particulars of the armaments of these forts it is sufficient to say that there are no vessels afloat that could approach nearer than one-half of a mile to these forts without being sunk by torpedoes, unless some skillful inventor shall devise a hitherto unthought of protection against these hidden and deadly machines. But at the distance mentioned the ships would be only seven miles from the battery, and if they could maintain their position there, and if they had guns with a range of eight miles, they could easily bring the lower part of the city to grief.

Assuming that a Krupp 71-ton gun was used, throwing a shell of 1,760 lb., containing a charge of 73 lb. of powder, the destruction would soon reach into the millions. One such shell exploding in a warehouse would wreck it from cellar to roof. Since it is very probable that a range of eight miles will be obtained in the near future, the invulnerability of the city in this direction depends upon the fort at Sandy Hook and the efficiency of our torpedo system.

But there is another direction whence the city could be reached if guns can be invented of sufficient range. From the Battery to the sea beach of Long Island, seven miles from the Sandy Hook fort and five miles east of Fort Hamilton, the distance is exactly ten miles, and one mile further brings one to the 25-foot line of soundings. In other words an iron-clad drawing twenty-four feet of water can approach within eleven miles of the Battery without exposing herself to the slightest danger of even being fired at. Consequently it needs only a gun to carry twelve miles to place the whole of Brooklyn and the wealthiest part of New York at the mercy of an enemy. Such a gun is not only possible but extremely probable; and, in view of the helpless position in which we should then be placed, in the absence of any navy to take the offensive, it might be well for our business men to take thought for the future by asking Congress to give them some form of protection in the event of war. It opens the widest field for the inventive genius of this country to exert itself to devise such protection.

SCIENCE TEACHING IN SCHOOLS.

The Report of the Committee on Science Teaching in Schools, signed by Professors E. L. Youmans, A. R. Grote, J. W. Powell, and J. S. Newberry, and read before the American Science Association by Dr. Youmans, is a severe but not unjust arraignment of the unscientific methods by which science is usually mistaught in schools. The chief aim of the committee was to inquire how far the public school system has availed itself of the valuable aid which science offers in the proper cultivation of the minds of the young. The association aims to advance science by the promotion of original investigation, and is naturally interested to know whether the methods of the schools favor or hinder genuine scientific study; whether they foster the early mental tendencies that lead to original thought, or thwart and repress them.

That the latter is generally the case is only too evident; yet in every school the belief is that science is taught, and taught scientifically. The reason why fact does not conform to theory in this matter may be found in the single circumstance that the majority of teachers are untrained or contra-trained for scientific thinking, while the few who could be and would be glad to be scientific in their methods of teaching are prevented by the fixed requirements of the schools as developed on examination day. In the words of the committee, the old idea of a school is a place "where knowledge is got from books by the help of teachers, and our public school system grew up in conformity with this ideal. The early effect of grading was to fix and consolidate irrational methods. The sciences were assimilated to the old practice, and the science teaching falls short at just the points where it was inevitable that it should fall short. The methods of school teaching and the habits of the teachers had grown rigid under the regime of book studies. As a consequence, the science teaching in the public schools is carried on by instruction. Through books and teachers the pupil is filled up with information in regard to science. Its facts and principles are explained as far as possible, and then left in the memory with the other school acquisitions. He learns the sciences as he learns geography and history. He is not put to any direct mental work upon the subjects of science, or taught to think for himself. As thus treated, the sciences have but little value in education. They fall below other studies as means of mental cultivation. Arithmetic rouses mental reaction. The rational study of language, by analytical and constructive tasks, strengthens the mental processes; but the sciences are passively acquired in their results. This is not scientific education, because there is no practice in the scientific method. Science, as a means of training the faculties, in the various ways to which they are severally adapted, is not taught in the public schools. It is not made the means of cultivating the observing powers, or of stimulating inquiry, or of exercising the judgment in weighing evidence, or of forming original and independent habits of thought. As remarked by Agassiz, the 'pupil studies nature in the school room, and when he goes out of doors cannot find her.' This mode of teaching science, which is by no means confined to the public schools, has been condemned in the most unsparing manner by all eminent men of science as a deception, a fraud, an outrage upon the minds of the young, and an imposture in education."

Futher on the committee justly remark that the failure to gain the benefits of real scientific study seems to have its source deep in the constitution of the public schools. In dealing with masses of children classification became necessary, which gave rise to grading and an elaborate mechanical system. The working of children in lots is a great convenience to the teacher, but it strengthens the method of verbal instruction, recitations, and lesson-giving. It is well fitted to impress the public with the idea that there is much done in the schools. There is a prescribed routine of operations and a display of order that is admired. But teacher and learner are subordinated to the system. It is machine work, and the machines make no allowances. Graduation assumes and enforces a uniformity among pupils that is false to the facts. Wide personal differences of capacity, aptitude, attainment, and opportunity not only exist among children, but they are the prime data of all efficient mental cultivation. In the graded schools, just in proportion to the perfection of the mechanical arrangements, individuality disappears; and with individuality goes originality. Science, if rightly pursued, is the most valuable school of self-instruction. From the beginning men of science have been self-dependent and self reliant, because self-taught. They have been more hindered than helped by the schools. De Candolle, in his valuable book on the conditions which favor the production of scientific men, says that the discoverers, the masters of scientific method, have chiefly appeared in small towns where educational resources have been scanty, and that they have often been most helped by the poorness of their teaching, which means that the schools were not so perfect as to kill out all originality.

Where there is any cure for this state of things, whether it is possible for the lower schools to teach science scientifically, the committee does not say. The truth is education and schooling are and always have been radically at variance, meaning by education an orderly growth in right mental habits through the reasonable attainment of exact knowledge. In the child world there is no science; and the attempt to cram boys and girls with scientific information—science teaching as commonly understood and practiced—is necessarily fatal to the habit of scientific thinking. On the other hand, if the teacher is to be simply the guide of pupils in their pursuit of real knowledge, in their scientific exploration of the world that lies next to them in space, and in their scope of intelligence, the public must be content with a plentiful lack on the part of their children of the conventional information by which parents judge of the instruction and education of children. Until parents have a truer idea of what knowledge is most worth there can be little hope of radical improvement in this part of school work.

A CHANCE FOR INVENTORS.—THE $5,000 CAR.

Our readers will remember that a prize of $5,000 was offered last year by the American Humane Association for a cattle car so constructed as to allow cattle to lie down while in transit, and to be fed and watered while in the cars. This to prevent the suffering caused by long standing and the injury and delay incident to unloading and reloading. The president of the association, Mr. Edwin Lee Brown, announces in a circular that the money has been pledged and nearly all of it paid over to the secretary of the association and deposited with trustworthy bankers. All competitors for the prize are required to send their models and plans, with full descriptions, to Mr. Brown, corner Clinton and Jackson streets, Chicago, Ill., before the 1st day of October next. All communications with regard to the prize should also be addressed to Mr. Brown.

The judges appointed are Edwin Lee Brown, Chicago, Ill.; John B. Winslow, Boston, Mass.; A. Kimball, Davenport, Ia.; William Monroe, Brighton, Mass.; E. T. Jeffery, Chicago, Ill.

The judges do not prescribe the size or the internal arrangement of the needed car; but among plans which meet the conditions, that will have the preference which can most readily and cheaply be adapted to the cattle car now in use. Of course, also, that car which can be most easily adapted to the transportation of other live animals and merchandise, if in other respects satisfactory, will have the preference.

It is expected that competitors will take out patents for their inventions, before submitting them, or not, as each shall choose; but the judges must be fully satisfied of the legal title of a claimant to his invention, before awarding to him the prize, or any part of it. The prize winner must also convey to the American Humane Association, or to such persons as its Executive Committee shall designate, a patent for the United States and Canada of the invention, which shall be satisfactory to said committee, before any part of the prize money will be due to him.

As models and plans may be seen by others than the judges while in their possession, they suggest, as a precautionary measure, that each inventor file a caveat at the United States Patent Office before sending them.

The East River Bridge.

The first consignment of steel—27,460 pounds—for the superstructure of the East River Bridge has been received, and rapid deliveries are expected from this time on, the Edgemoor Iron Company having put its full force upon this contract. The guys of the superstructure, manufactured by the Roeblings at Trenton, of Bessemer steel, have also arrived. The Cambria Steel Company, which furnishes the steel, has about a thousand tons ahead of the Edgemoor Company. Colonel Paine reports that the steel has all been tested and is of superior quality, the strength of the steel trusses being six times greater than is likely to be required.

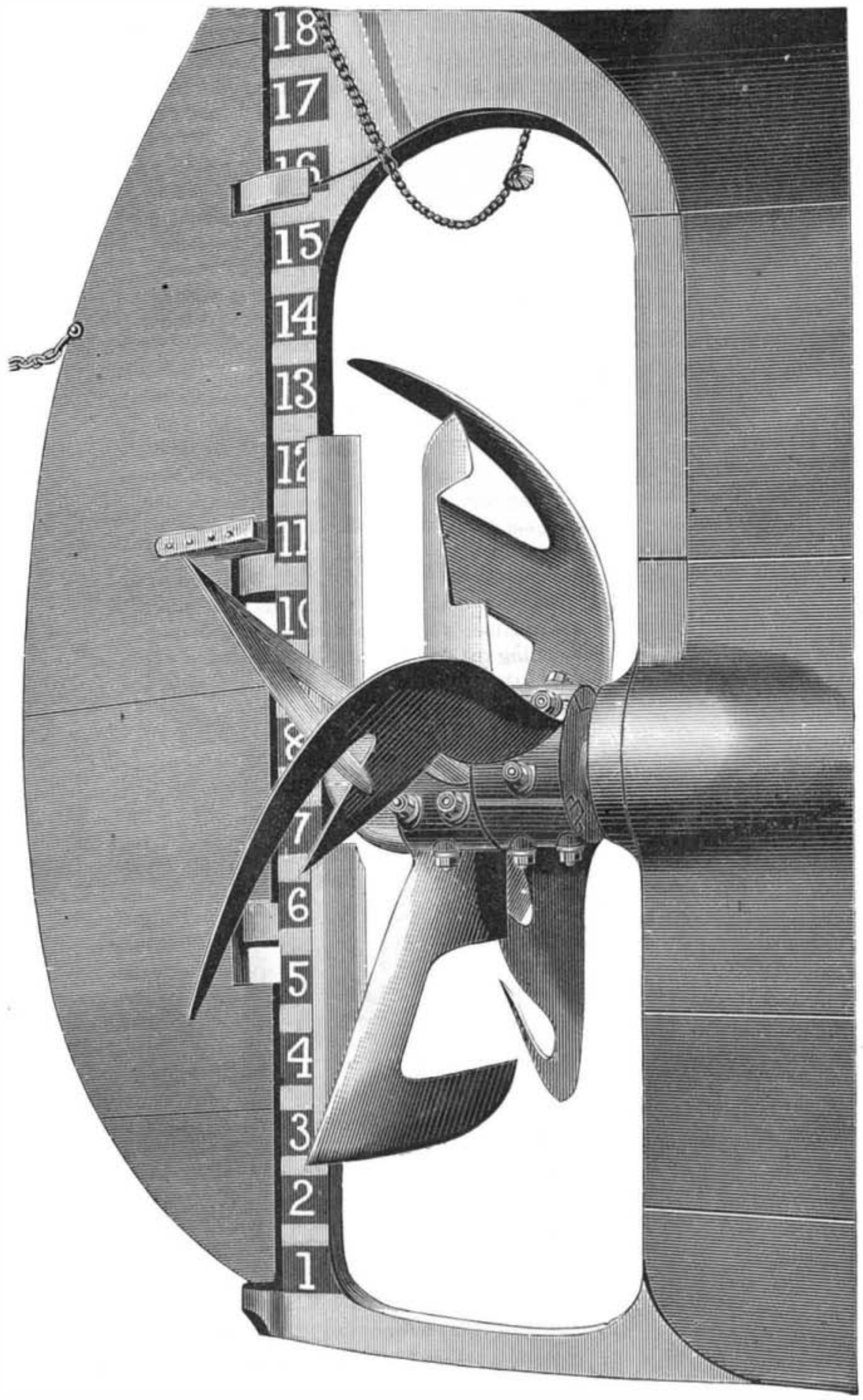
The last structure to be razed to make room for the New York approach will soon be cleared away. Thus far the bridge has cost $14,000,000—of which sum $3,000,000 went under water and $4,000,000 went for real estate, to be covered by a mile of costly masonry. In the profile drawing of the completed structure the lofty towers sink to comparative insignificance. The projection carries in the observer's mind a sense of length rather than of height. The superb arches at Vandewater and Rose and William and North William streets, the massive anchorages at Franklin square in New York and Main street in Brooklyn, and the airy bridge over Pearl street become, says a critical observer, more conspicuous in this picture than are the towers, which are so imposing as seen at midstream on the East River.

It is calculated that with the greatest possible weight on the bridge and in the hottest of August days, with the tide at its highest, there will be 135 feet 6 inches in the clear between the lowest point in the bridge, midstream, and the surface of the East River.

THE production of Bessemer steel rails in the United States in 1869 was 2,550 tons; in 1878, 550,398 tons, and 9,307 tons of open-hearth steel rails in addition.

THE DE BAY PROPELLER.

The De Bay propeller, an English invention, which has attracted much attention since its efficiency was made public by a series of experiments in 1879, has recently been fitted to a steamship of a sufficient size to give a decided test of its value. The Cora Maria, a steamer of 831 tons net register and 2,800 tons displacement, was the vessel used for the experiments. Her dimensions are: Length, 235 feet; breadth, 31 feet; depth, 18 feet 3 inches. Her engines are of the compound inverted cylinder and surface condensing type, the high pressure cylinder being 28 inches, and the low pressure cylinder being 54 inches in diameter, with a stroke of 3 feet. The screw used in the first experiment was an ordinary four-bladed screw, having a diameter of 13 feet 2½ inches, and a pitch of 19 feet 6 inches. With this screw a



THE DE BAY PROPELLER.—THE TWO HUBS WITH THEIR BLADES MOVE IN CONTRARY DIRECTIONS.

trial was made over a course of two and one-fifth knots on the 10th of July last, and then the De Bay gearing and propeller (diameter 11 feet) were fitted to the vessel and a trial was made under exactly similar conditions on the 10th of August. The results obtained from each trial are herewith tabulated for comparison, it being understood that in each case four runs over the course were made, the first and third being with the tide and the second and fourth against it.

	Ordinary screw.	De Bay propeller.
Average revolutions per minute	66·32	65
Average steam pressure, pounds	74·7	74·5
Average vacuum, inches	25·58	24·25
Indicated horse power	584·51	585

TIME.

	First course.	Second.	Third.	Fourth.
Ordinary screw	12m. 5s.	20m. 27s.	12m. 3s.	19m. 56s.
De Bay propeller	9m. 4s.	16m. 42s.	9m. 6s.	16m. 10s.

SPEED IN KNOTS PER HOUR.

	First course.	Second.	Third.	Fourth.
Ordinary screw	10·924	6·45	10·954	6·62
De Bay propeller	14·557	7·898	14·505	8·162

TURNING THE CIRCLE.

	Ordinary screw.	De Bay propeller.
To port	4m. 44s.	4m. 33s.
To starboard	6m. 51s.	5m. 4s.

The mean speed obtained on each trial was 8·73 knots for the ordinary screw and 11·28 knots for the De Bay propeller, or an actual gain for the latter of over 29 per cent for the same expenditure of power. Assuming that the resistance varies as the cube of the speed (and practically this ratio is greatly exceeded), since it required 584·51 horse power to drive the Cora Maria at a mean speed of 8·73 knots with the ordinary screw, it would have required 1,256·69 horse power to drive her at the speed of 11·28 knots obtained by the De Bay propeller. We might easily go on to calculate the immense saving in fuel thus obtained, but the foregoing figures are sufficient to call attention to the advantages of the new propeller.

With the ordinary screw there is, as every one knows, a great deal of vibration, and the stern of a screw steamer shakes and quivers very unpleasantly; while the De Bay invention produces no local commotion at all.

Since the first trial in 1879 the shape of the larger half of the propeller blades has been somewhat altered. Formerly they were designed so that they nearly filled up a segment of a circle having the same diameter as the propeller. They now have a curved form in place of an angle, and each blade, instead of a uniformly increasing pitch, has a pitch of 17 feet to half radius, increasing therefrom to a pitch of 19 feet to 21 feet.

The Cora Maria is now on a voyage to Alexandria, Egypt, with a full cargo, and the reports of her captain and engineer will be awaited with great interest.

TRAVELING FLIES.

On the afternoon of Saturday, September 4, the steamboat Martin encountered, on the Hudson River, between New Hamburg and Newburg, a vast cloud of flies. It reached southward from shore to shore as far as the eye could reach, and resembled a great drift of black snow. The insects were flying northward "as thick as snow flakes driven by a strong wind." The steamer Mary Powell ran into the fly storm off Haverstraw, some forty miles below where the Martin encountered it. The flies were "long and black and had light wings."

A dispatch from Halifax, Nova Scotia, states that on Sunday, Sept. 5, immense swarms of flies passed over Guysboro, 120 miles north-eastward of Halifax. They came from the east and resembled a dark cloud.

A correspondent of the Toronto *Mail*, writing from East Pictou, Nova Scotia, describes a similar phenomenon as occurring there August 21. The flies, forming a veritable cloud, passed Lismore at 6 o'clock in the evening, close to the shore. They went with the wind, which was blowing lightly from the west, occupying about twenty minutes passing a given point. They made a loud, buzzing noise, which was heard by many who missed seeing them. They flew so low that some of them appeared to fall into the water. About two miles below Lismore they slightly changed their flight, heading more to the north. After their passage numbers of strange flies were observed in some of the houses near the shore. They were about half an inch in length, with wings proportionately longer than those of the common house fly, but whether they belonged to the swarm is uncertain.

In none of these American reports are the flies mentioned as biting, like the swarm of flies which invaded the port of Havre, France, a few weeks ago. From the indefinite descriptions given of them it seems possible that the American flies may have been ichneumon flies, which have had an exceptionally favorable season for multiplication, owing to the multitudes of army worms in which they deposit their eggs.

American Glass Making.

The first glass factory in America was erected in 1609 near Jamestown, Va., and the second followed in the same colony twelve years later. In 1639 some acres of ground were granted to glassmen in Salem, Mass., probably the first year of the industry which was prosecuted there for many years. The first glass factory in Pennsylvania was built near Philadelphia in 1683, under the direction of Wm. Penn, but it did not prove successful. The first glass factory west of the Alleghenies was set up by Albert Gallatin and his associates in 1785, at New Geneva, on the Monongahela River. A small factory was established on the Ohio River, near Pittsburg, in 1790, and another in 1795. The earlier attempt failed, the later was quite successful. In 1810 there were twenty-two glass factories in the country, with an annual product valued at $1,047,000. There are now about five times as many factories, producing eight times as much glass. According to the returns received under the recent census, our flint glass factories turn out 210,554 tons of table and other glassware; and the window-glass works produce 2,644,440 boxes. The total value of the product is nearly $45,750,000.

The Anglo-American Telegraph Company.

This company has lately laid a new cable between Ireland and Newfoundland, and now has four separate cables in operation. By the use of the new duplex system the directors report that they are able to do as much business on these four cables as could formerly have been done on eight cables.