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**Contents.**

(Illustrated articles are marked with an asterisk.)



TABLE OF CONTENTS OF

**THE SCIENTIFIC AMERICAN SUPPLEMENT,**

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## ALEXANDER LYMAN HOLLEY.

In the death of Alexander L. Holley, in Brooklyn, N. Y., January 29, the country loses one of its best known mechanical engineers and writers upon engineering subjects, and the world one of its foremost men of affairs.

Mr. Holley was born in Lakeville, Conn., January 20, 1832. His early taste for mechanics led him to spend some time as a boy working at the machinist's trade. In college he took the scientific course, graduating at Brown University, Providence, R. I., in 1853. From college he passed to the machine shop of Corliss & Nightingale, in Providence, now the Corliss Steam Engine Works, where he served in the double capacity of workman and student. Subsequently he spent some months as locomotive engineer on the Stonington and Providence Railroad, and then entered the New York Locomotive Works as draughtsman. About this time he began the contributions to technical journals which have since been so numerous and valuable. In 1856 he bought the *Railway Advocate* (founded by Zerah Colburn), and shortly after he went to Europe to study the working of the railway systems there. One of the fruits of these studies was the valuable report on American and European railways brought out by him in connection with Mr. Colburn. While abroad at this time Mr. Holley expressed in letters to the New York *Times* the notable prediction that screw propulsion was destined to supersede side wheels for ocean navigation. He returned on the first voyage of the Great Eastern to this country. In 1860 was published his book on "Railway Practice," which added materially to his standing in this department of engineering.

In the capacity of consulting engineer in the construction

ALEXANDER LYMAN HOLLEY.

of the famous Stevens Battery, he became greatly interested in ordnance and armor, and accordingly revisited England in 1862 to study the latest improvements in marine warfare. The immediate results of these studies was the "Treatise on Ordnance and Armor," which was promptly accepted on both sides of the ocean as a standard authority. A collateral and more important result of this visit was an acquaintance with the then newly developed Bessemer process of steel making, the great importance of which Mr. Holley was quick to appreciate. With characteristic foresight he secured the control of the American patents of Mr. Bessemer, forming for their development the firm of Griswold, Winslow & Holley, whose experimental plant, at Troy, N. Y., was the pioneer establishment of the sort in America, the success of which was largely due to improvements introduced by Mr. Holley. This enterprise was followed in 1867 by the establishment of the Pennsylvania Steel Works, near Harrisburg, Pa., plans for which were furnished by Mr. Holley, who had for some time persona' charge of the works. Other works of this class built by Mr. Holley, or under his supervision as consulting engineer, were those of the North Chicago Rolling Mill Company, the Joliet (Ill.) Iron and Steel Company, The Bethlehem (Pa.) Iron Company, The Edgar Thomson Steel Company, near Pittsburg; the Lackawanna Iron and Coal Company, Scranton, Pa.; and the Vulcan Iron Company, St. Louis, Mo. The improvements in the Bessemer plant and processes introduced by Mr. Holley in these works were many and valuable. After the last named works were constructed Mr. Holley turned his attention to the open hearth process for steel making, and designed the plants for the Cambria Iron Company, the Springfield (Ill.) Iron Company, and the Spaug Steel and Iron Company, of Pittsburg, Pa. For the past two years Mr. Holley has devoted his time mainly to the interests of the Bessemer Association, studying the adaptation of the basic process to the Bessemer plant.

Notwithstanding these severe and laborious engagements, Mr. Holley made time to aid in many ways his fellow laborers in the several departments of engineering progress. He was a prominent and active member of the American Society of Civil Engineers, the Iron and Steel Institute of Great Britain, the American Institution of Mining Engineers, and the American Society of Mechanical Engineers, and had served as presiding officer of each of the American Associations. He also served for some time as a member of the United States Government Board for testing the strength of metals, as trustee of the Rensselaer Polytechnic Institution, at Troy, N. Y., and as lecturer at the School of Mines, Columbia College.

Personally Mr. Holley was of the finest temper and amiability of disposition, genial, witty, and kindly to the highest degree. For the excellent portrait herewith, and for many facts with regard to Mr. Holley's life and labors, we are indebted to the courtesy of the *American Machinist*.

## SOME QUESTIONS OF COAST DEFENSE.

Every year, in their annual reports, our military and naval authorities dwell with more or less of emphasis upon the exposure of our coastwise cities to attack, in case of war, and our manifest lack of guns, forts, and ships for their defense. Every year the questions involved are more or less earnestly discussed in Congress and in the newspapers; and every year goes by without seeing any positive movement toward providing a remedy for the undesirable state of things which all parties pretend to deplore.

The difficulty would seem to lie not in any lack of popular interest, in or out of Washington, but in a positive and general lack of agreement as to what ought to be done. The naval authorities naturally urge the building of more and better ships, and the construction of powerful guns for their armament. Given the ships and guns, backed by proper shore batteries and torpedoes for the inner lines of defense, and, they say substantially, the security of our popular and wealthy seaports will be assured. The military authorities as naturally call for the strengthening and more efficient arming of the forts about our harbors, floating batteries and torpedo systems being regarded as entirely subsidiary. The torpedo service is disposed to consider forts and ships in the light of means for more securely and effectually operating torpedoes, which, after all, should be the main reliance. But neither arm of the service appears able to convince Congress or the people that any device or combination of devices now developed is quite sufficient to meet all the requirements of this case.

The conditions of coast defense for this country are peculiar in comparison with those obtaining in Europe. The breadth of sea between us and any other first-class nation is so great that no permanent invasion of our shores need be feared. And as we have no colonies to defend, no allies to champion, no foreign commerce to protect, we have no need of a navy for aggressive uses. Could we use a navy economically in coast defense?

The curvature of our Atlantic coast, which chiefly needs defending, is such that a hostile fleet rendezvoused at the Bermudas, would be within three or four days' striking distance from either of our Atlantic seaports, from Portland to St. Augustine. And the longest time that would elapse between the discovery of the destination of a threatening fleet would be too short to allow of any concentration of naval forces to withstand the attack. To defend our entire coast by ships would, therefore, require, at each and all of ten or more ports, ships and guns enough to repel the largest fleet that could be brought against such port. Obviously a purely naval defense of such an enormous stretch of coasts would be neither practicable nor economical.

It would be possible to erect and arm at points commanding the entrances to our harbors ironclad forts amply capable of repelling any fleet that might try to enter is beyond question. In conjunction with channel torpedoes it would not be a hard thing to keep the most powerful of war vessels from forcing the harbor. But the sealing up of a harbor's entrances would not in all cases be coincident with the protection of the port and the city within.

For instance, a modern ironclad armed with the most powerful of existing guns could greatly injure, perhaps entirely destroy, New York city and Brooklyn without coming near enough to a shore battery, however placed, to be in serious danger from guns of equal power to those of the ironclad. There are guns that will throw shot and shell from eight to twelve miles. But the same guns would not penetrate the armor of an ironclad (allowing that they could hit it) at anything like that range.

Those of our coast cities that lie from ten to twelve or more miles from the sea may be protected by properly placed land fortifications, properly armed and armored. But New York and Brooklyn are not so situated. Forts and torpedo systems for the channels to the harbor might successfully guard these cities against capture; but they would be powerless to save them from grievous harm at the hands of a determined enemy.

The question of defense for New York resolves itself, accordingly, to this: How can we keep an ironclad or a fleet

of them from coming within range? We must go out to the enemy and destroy him, or drive him away. Such service may be performed:

1. By heavily-armored floating batteries, carrying the most powerful guns.
2. By swift and powerful rams.
3. By torpedo boats capable of being operated in rough water and at a great distance from the shore.
4. By small, swift vessels, armed with the heaviest guns.
5. By torpedo-missiles thrown through the air.

To meet great ironclads with great ironclads would seem to be an extremely expensive and hazardous proceeding, even if competent vessels of this sort were in possession and could pass in and out over the outer channel bars. The utility of rams is beyond question—provided they are swift and staunch and easily handled. Such rams are yet to be built. Small and swift gunboats, each carrying one gun of the highest attainable efficiency, might do the work. But this type of vessels, also, is yet to be developed. Great things are promised under the Lay torpedo combination; but as yet the torpedo for open sea use is practically unknown. The use of torpedo missiles to be launched through the air is as yet a mere suggestion. Shells charged with gunpowder are destructive only when they have buried themselves in the target. The more sudden and powerful explosives act differently and far more destructively. It is now possible to charge a torpedo with two non-explosive substances, a liquid and a solid, which become powerfully explosive when mixed. Would it be possible to charge projectiles with these substances? Until the two were combined the shell would be as safe to handle as a solid shot. In the act of firing or during the transit of the shell through the bore of the gun the gas pressure upon the base of the projectile might be made to crush the cell containing the liquid; the mixture of the ingredients would be effected during the flight of the projectile, and the originally inert charge converted into an explosive as powerful as dynamite, which, by well-known means, might be fired by the impact of the shell on striking. In this case the damage would not be measured by the penetrative power of the gun, but by the disruptive power of the torpedo-projectile. With such projectiles war ships might be kept from coming within miles of shore by simple and comparatively inexpensive land batteries.

Another line of development in torpedo warfare would seem to be possible in the direction of submerged or nearly submerged small torpedo craft, to be operated by one or two men, yet capable of planting against the side or bottom of an ironclad torpedoes of sufficient force to sink any vessel, however well armored. These small craft might win by sheer force of numbers, while the hazard of life would be reduced to the smallest.

In most of the discussions of this question it is tacitly assumed that defense must be sought by the conventional means of military and naval warfare; that we have little choice but to copy the processes and appliances upon which so much money has been spent in Europe. A wiser way would be to assume that the old means are substantially antiquated, except for use along the inner lines of defense, and to offer to inventors such inducements in the way of provisions for testing their novel devices as would encourage the boldest development of new ideas. The problem of coast defense is a serious one; and the hope of the country of safety in the emergency of war hangs upon invention, bold and radical invention, not in costly appliances in the way of ships, forts, and the like, whose day of possible usefulness usually passes before they can be made ready for actual service.

THE OLD SCIENTIFIC AMERICAN OFFICE, 37 PARK ROW, NEW YORK. DESTROYED BY FIRE, JANUARY 31, 1882.

## BURNING OF THE OLD AND OPENING OF THE NEW SCIENTIFIC AMERICAN OFFICES, NEW YORK.

A business residence of some twenty-five years in the old quarters, No. 37 Park Row, New York, had rendered us almost oblivious to the fact that ours was not a fireproof dwelling with modern improvements. We were rudely aroused from a fancied security on the morning of January 31, at 10 o'clock, by a sudden alarm of fire. The cry was "Run for your lives!" and of the forty or fifty persons forming our corps of assistants, all, except half a dozen or so, rushed for the stairways, and, happily, gained the street in safety. The few who tarried, perhaps three seconds, were cut off from the stairs by the flames; these were Mr. Cyrus L. Topliff, of our financial department; Mr. B. G. Underwood, of our advertising department; Mr. Henry E. Mead and Mr. F. L. Seitz, of our art department; Mr. W. M. Avery and Mr. Harrold Avery, of our engraving department; Mr. C. N. Tillottson, of our subscription and mailing department, Mr. Charles Sedgwick, of our record department, and Mrs. Markey, janitress of our office. We are under obligations to them for their efforts to save property. They were taken from the third story windows by the gallant firemen who rapidly put up the ladders and rescued not only our people, but scores of others from the windows adjacent and above our premises. The splendid and effective services of the firemen on this occasion merit the highest praise, and show the excellence of their organization.

To the exertions of Mr. Topliff, of our financial department, whose coolness and presence of mind were conspicuous, we are much indebted. For him and Mr. Tillottson the alarm meant the instant gathering and placing of our records, subscription books, drawings, and correspondence, in the large fireproof safes provided for that purpose, and the locking of the safe doors.

The fire spread with such amazing rapidity that in fifteen minutes the great building was in flames from top to bottom. It had three fronts: Park Row, Beekman Street, and Nassau Street. Our establishment occupied most of the entire third floor, nearly two hundred feet long and fifty wide. We give an engraving showing our establishment as it appeared before the fire. The reader will be able to picture for himself, better than we can describe, the thrilling spectacle that was presented when the building was wrapped in flames.

There was a leaden sky; a snowstorm was in progress; great volumes of smoke and fire belched from the windows; groups of helpless men were seen clinging here and there to the window sills, calling for help; the streets below were filled with hurrying firemen and horses, hissing steamers, ladder and hose carts, stand pipes and fire paraphernalia of all kinds. In the background of the City Hall Park were fifty thousand spectators, whose cheers of joy made the welkin ring when the ladders went up and the rescue was complete.


THE NEW SCIENTIFIC AMERICAN OFFICE, 261 BROADWAY, CORNER WARREN STREET, NEW YORK.

Several hundred persons were in the building, but all escaped, it is thought, except seven, who, sad to relate, lost their lives, two by jumping, through fright, from the windows before the ladders arrived. The others, it is believed, were overwhelmed by the gas and smoke. Three of the lost were employed in the office of the New York *Observer*, which adjoined our own office. From the fourth story window above us a young woman of 17 years, Miss Green, leaped to the pavement, and was caught and saved in a tarpaulin, held by Mr. O. F. Gunz, Theo. Hoster, and H. L. Goodwin, of the SCIENTIFIC AMERICAN office, and others. She says she was told to jump, and did so, became instantly unconscious, and knew nothing of the result until she recovered her senses in a neighboring store.

The fire was caused, it is supposed, by the overheating of a chimney, which set fire to woodwork of the lowest floor, and, once started, it ran up the elevator shaft with almost lightning velocity. It was an old-fashioned building, floors, beams, and mazes of partitions, all pine, of quarter of a century dryness. No wonder that it burned quickly. In half an hour the walls fell in and the old SCIENTIFIC AMERICAN office was in ruins.

Two hours later we had leased the elegant series of offices in the large building of the United States Life Insurance Company, 261 Broadway, corner of Warren, across the Park, opposite our former quarters; and before nightfall loads of desks, chairs, drawing tables, books, and instruments had been delivered, our helpers were at work, and the hum of the SCIENTIFIC AMERICAN beehive had again begun.

The late fire makes no interruption in our business. Our printing and mailing was all done in another building; all our plates were preserved, and the regular issues of the SCIENTIFIC AMERICAN and SUPPLEMENT proceed as usual. Nearly all of our books, records, correspondence, and patent drawings were preserved. The principal loss was in furniture and back numbers of our publications. The latter are being rapidly reprinted from the plates. Some hundreds of old models, and a few new ones, are in ashes. But this is of little account, as the Patent Office does not now require models except in special cases.

Hardly had we taken possession of our new quarters when we began to receive letters and telegrams from hundreds of friends. The *American Machinist* most promptly and generously offered us the use of all their types and engravings. We have gladly availed ourselves of this kindness in making use of the excellent portrait of the late Mr. Holley, engraved specially for the *Machinist*, together with the excellent biographical sketch written by our contemporary. To the proprietors of the *American Machinist*, the *Mechanical News*, the *Mechanical Engineer*, *Science*, the New York *Times*, the *World*, the *Independent*, *Engineering News*, and other papers, we return our sincere thanks for their kind offers of printing and other facilities. We also gratefully acknowledge the kind invitation of Mr. Thomas D. Stetson and Mr. David L. Haight, of the Vanderbilt Building, to occupy their offices temporarily; and the proffers of aid from Messrs. Brown & Brown, from Elihu Root, Esq., and many others.

Our good fortune in so quickly finding suitable shelter from the snow storm rendered it unnecessary for us to take advantage of these kind offers; but we appreciate all the same the generous spirit that prompted our friends, and we shall remember them with gratitude.

We are asked, in view of this calamity, what we consider to be the best protection against fire. We say a good fireproof building. The New York *Times* edifice, which adjoined the burned structure, is built with iron beams and brick arches, and suffered no damage except some water.

We are also asked as to the best fire escape. We say a stout chain, long enough to reach the ground, and attached ready for use within every separate apartment of the building.

We are also asked as to the best fireproof safes. We say Marvin's, 266 Broadway. In them were saved the SCIENTIFIC AMERICAN drawings, books, and records, from this great fire. On the morning of the second day our books were in use. But more of safes hereafter.

Our new offices at 261 Broadway are unequaled for excellence and convenience of location. We give herewith an engraving of the new building. It is located near the general Post Office, opposite the City Hall Park, and in front of the entrance to the great suspension bridge between New York and Brook.


THE BRANCH OFFICE OF THE SCIENTIFIC AMERICAN, CORNER F AND 7TH STREETS, WASHINGTON, D. C.