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, DECEMBER 17, 1898.

UNSUSPECTED PERIL IN ELEVATORS.

The recent shocking elevator accident in the United States Fire Insurance Company's building, William Street, New York, which resulted in the death of the secretary of the company, Walter H. Griffin, the serious injury of Thomas W. Cauldwell, a director, and minor injuries to the other occupants of the car, has opened the eyes of the public to an unsuspected but very grave peril in one of the most common forms of elevator.

Since the epidemic of elevator accidents which visited this city last year, when such noted structures as the American Tract Society building, the Waldorf-Astoria Hotel, and the General Post Office were the scenes of more or less serious breakdowns, New York has been comparatively free from disasters of this kind. The accidents of that period were of such a nature that the cause was easily ascertained, and the lessons which were learned have been put to good account by both the builders and operators of this class of machinery.

The United States building accident, however, is of an entirely novel kind, nothing like it, as far as we can learn, having happened before. It has served to show that there are some contingencies that may escape the most careful safeguarding against accident, and it teaches us that in elevator-work involving the constant movement of heavy suspended weights through vertical distances measured by the hundreds of feet, it is well to provide even against those breakdowns which are apparently, in the nature of things, impossible. In the present case the car containing eight people had descended to the ground floor, and the occupants were commencing to leave the car, when several 100-pound weights became detached from the counterbalance cage at the top of the shaft and fell through the full height of eleven stories upon the roof of the car.

The elevator is of the Otis overbalanced electric type, so named because the weight of the car is overbalanced by counterweights, which are attached to the car by wire ropes that pass over pulleys located at the top of the shaft. The counterbalance weights travel in a vertical guideway at the side of the elevator shaft, and they are placed in two cages or stirrups, placed one above the other, with a space of a foot or two between them. Each cage is hung by its own separate ropes. The upper cage contains the weights that counterbalance the car, and its ropes run directly up over the top pulleys and down to the car. The lower cage contains the counterweights for the live load (passengers), and its ropes pass by the car counterweights over a top pulley and down to the back of the winding drum. A winding rope also passes from the front of the drum, over a top pulley, and down to the car.

The object of the counterweights is to relieve the strain on the car hoisting ropes, due to the sudden starting and stopping. Thus we may state a typical case in which the empty car weighs 2,000 pounds and its counterweight acting on the car 1,500 pounds, while the live load provided for is 2,000 pounds, counterweighted by 1,500 pounds acting on the back of the winding drum. It is evident that the greatest deadweight to be overcome by the electric motor is never over 1,000 pounds. The motor, when the car is empty, will have to lift 1,000 pounds excess of counterweight, and when the car is full will have to lift 1,000 pounds excess of live load. In the normal condition of working, when the car is half full, the car and load will about balance the combined dead and live load counterweights.

The car is arrested at the top and bottom of the shaft by means of an automatic catch on the motor, which switches off the current at the proper moment. It seems that the catch was out of place by an amount equivalent to two or three feet of travel of the car; so that on this particular occasion, instead of the motor stopping when the car reached the bottom, it continued to wind up the lower case of weights, which, as we have stated above, was attached through its ropes to the drum. The lower cage was lifted in the groove until it struck the upper cage, which it carried up with it until the top edge of the upper cage brought up against an iron beam of the overhead grating of the shaft. The continued pull of the rope caused the lower cage to crush and bend open the vertical bars of the upper cage, thereby allowing the loose weights which it carried to fall out and down the shaft.

It should be explained that the cages consist of a solid top and bottom weight connected by two vertical rods. The space between these weights, which are fixed, is filled in with loose weights (used in adjusting the overbalance of the car), which are held in place by notches at their ends which embrace the two vertical rods, above mentioned, of the carriage. The vertical rods were only expected to be subjected to a tensional strain, and sprung open at once when they were compressed between the upper grating and the lower car acting under the pull of the motor.

This is the first instance on record of an accident of this character, and it teaches a very plain lesson, which the makers, not only of this, but of all forms of counterbalanced elevators, should make haste to act upon. The counterweight cages should at once be changed so as to render the spilling of the loose weights an impossibility. Either a bolt should pass down through every weight or the cage should be made of stout sheet iron or wire netting. Although it has taken nearly a score of years to reveal the existence of this peril, the terrible consequences of such an accident render it the duty of every maker and owner of such elevators to make the slight changes which are necessary to safeguard the public in future.

It is needless to say that the accident emphasizes the necessity for frequent and rigid inspection; for it was the misplaced automatic stop that was the immediate cause of the disaster.

FORTHCOMING IMPROVEMENTS IN UNITED STATES NAVAL ORDNANCE.

The present fiscal year, 1898-99 promises to be an unusually important one in ordnance development in the United States navy. As a result of the reports received from the various ships which were actually engaged in battle during the past summer, a number of important changes will be made in guns and mounts and in the make-up of the ships' batteries The 13-inch gun will give place to an improved type of 12-inch gun as the main armament of battleships, and a more powerful 6-inch gun will become the standard weapon for the arming of the main rapid-fire batteries. The 12-inch gun will be a weapon of much greater power than the present type, as installed on the "Iowa," and there is good reason to believe that the wire-wound system, which is in very successful use in the British navy, will be used in this and in the 6-inch gun. For the present, however, it is premature to announce the use of this system as a settled fact. The new 6-inch gun will have a velocity of 3,000 feet per second. This enhanced velocity will be effected by an increase in weight and length, but no change will be made in the present specifications for projectiles. The other conspicuous change will be the general substitution of 3-pounder guns on the heavier ships for 1-pounders. The 3-pounders may even be expected to largely displace 6-pounders, particularly on the smaller vessels. It is not generally known that the 3-pounder gun has a longer range than the 6-pounder. It is a fact, however, which is due to the employment of a proportionately larger amount of powder behind the 3-pounder shell.

The actions at Manila and Santiago have confirmed the lessons taught at Yalu that 1-pounder guns have a questionable value on board battleships and heavy cruisers. The range of these guns is deemed too limited. The action at Santiago was fought out at ranges, generally speaking, beyond 3,200 yards. The 1-pounder guns have their sight bars cut for only 3,000 yards.

The demand just now is for heavier guns in the secondary batteries of battleships, and in the United States navy provision is being made to supply pieces of 12-pounder and 14-pounder calibers. The 12-pounder was adopted several years ago in the British navy and is a favorite weapon. It not only finds a place in the batteries of battleships and heavy cruisers of that service, but is mounted on vessels of the torpedo-boat destroyer class. The battery arrangement on this last mentioned class is one 12-pounder and four 6-pounder guns. The United States destroyers of the Porter type, mounting four 1-pounder guns, make a rather light showing in comparison.

The new 14-pounder gun will have a muzzle velocity of 3,000 foot-seconds. For small vessels of too light construction to mount 4-inch guns in the extremities, the new 14-pounder is deemed an ideal weapon.

Assurance is given from a high quarter that all secondary battery guns for the United States navy of the 3-pounder and 6-pounder types will hereafter be built on the semi-automatic principle. The Maxim-Nordenfelt mechanism appears to be the type hit upon. The right to use this principle has been acquired by our naval authorities.

The manufacture of projectiles for secondary battery guns has been carried to that point where there is little difference in the cost of common shell and armor-piercing shell. This statement applies particularly to 3-pounder and 6-pounder projectiles. In consequence of this fact, armor-piercing shell, it is announced, will be issued exclusively from now on for the lighter calibers. The armor-piercing projectiles in calibers below the 4-inch carry explosive charges.

The Maxim-Nordenfelt automatic guns, which were installed in large numbers on board United States ships at the breaking out of the war, did good service, but, from the individual reports of officers, there were a good many instances of jamming at the outset. When the volute springs were well set up and the cartridge cases properly squared, the guns could generally be depended upon to run a belt out without stop, but there was more than one instance of cartridge cases pulling apart from the shells. The ammunition used was of English make, and the opinion has been quite freely expressed that in manufacture it was not up to the best American make. As a prominent ordnance official has expressed it, however, "When these guns did work well, they were ideal." The policy now is to make the 1-pounder guns of longer barrel and heavier. A rate of fire of 250 shots per minute is counted upon.

While foreign nations are employing high explosives to a large extent in naval shells, the policy in this country appears to be in favor of the retention of black powder charges. The latter can be depended upon to fire woodwork, and the action of one of these shells when bursting between decks is more diffusent than in the case of a high explosive charge. It was the black powder in the American shells which so early in the fight at Santiago set the Spanish ships on fire.

The reports from the various ships show that premature explosion of shells in the guns was not an infrequent occurrence during the war. The 5-inch gun of one vessel is said to have been badly scored by one of these happenings. On the "Manning" there were two instances of premature explosions in action, one a 4-inch shell, the other a 6-pounder, but the guns were not even marked. In squadron action before Santa Cruz del Sur a shell from a leading ship burst about 100 feet ahead of the "Manning," showing that the trouble in Commander Todd's fleet was not confined to one vessel. On the other hand, the action of the shells on striking on shore was not, according to later discoveries, always certain. Shells were picked up both at Daiquiri and about Santiago which had failed to detonate. In the case of the Maxim ammunition, the shells would often explode on striking the water. The "Manning" had occasion, when attached to Commander Todd's squadron, to use her Maxims on some thatched huts in the vicinity of Niquero, and it was found that the shells exploded with regularity, even when brought up by these light obstructions.

The attention of the ordnance officials has of late been directed to insuring a greater certainty of action in the fuses of all naval shells, and information at hand is, in effect, that the new fuses are more sensitive, while still possessing a good factor of safety. The trouble occasioned by shells exploding prematurely is ascribed to the doing away with burster bags. So long as the interior of the shell is given a smooth, lacquered surface, these accidents will doubtless be obviated. The rule now is to crowd as much black powder into a projectile as its interior space will hold. The idea is to obtain as great a mine effect as is possible.

Brown prismatic powder is now a thing of the past. Large contracts for the new smokeless powder are at present being filled, and it is confidently asserted in ordnance circles that there will soon be a sufficient supply on hand to fit out every ship in service. It takes at least one month to commence the delivery of smokeless powder, once a contract has been signed, and in these days of quick wars it is imperative to have a large reserve stock on hand.

The fear is expressed by many leading naval officials that the people will conclude that because this war was so easy, it will always be easy, and that it makes little difference what class of *materiel* the country has on hand or how much of it. The present policy of Commodore O'Neil, the Chief of Naval Ordnance, is to stock up the navy yards with liberal supplies of ordnance outfits; but as this costs money, the attitude of Congress has to be reckoned on.

The war with Spain has not only tended to ordnance changes, but to radical innovations in the preparation of ships for battle, and new regulations based upon the experiences of the past summer are promised shortly. From what can be learned, it is proposed to strip ships down hereafter as they have never been stripped before. Woodwork is to be torn out in ruthless fashion, and in those ships where the officers' living quarters are placed well up above the waterline, stateroom bulkheads, closets, and furniture are doomed to go. It is even a question if bunks will be retained. The recourse, in the event of taking out bunks, is hammocks.

There are certain articles carried on the decks of warships which are very convenient, such as chests and lockers, but in time of action these appurtenances only serve as so much fuel for flames. The new rule will be to mark in plain letters "Overboard" all fittings not essential to the working of a battery and which serve only to give off splinters. It is expected that opportunity will be afforded for ships to stow the greater part of their loose furnishings at the navy yards