and with the Blanco Encalada, built by Armstrong & Company, will show this very clearly.

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······										
	Displace- ment.	Horse power.	Speed.	Protective deck.	Normal coal carried.	Armament.				
	Tons.			Inches.	· ·					
Olympia	5,800	17,363	21.68	434 to 2	400	Four 8 in., ten 5 in. quick fire, four teen 6 pounders, ten light guns.	-   (			
Eclipse	5 <b>,6</b> 00	9,600	19.5	81⁄2	550	Five 6 in. quick fire, six 47 in, quick fire, eight 3 in. quick fire, six light guns.				
Blanco Encalada	4,400	14,500	22 <b>·</b> 78	4 to <b>13</b> 4	900	(Two 8 in., ten 6 in. quick fire, twelve 3 in. quick fire, twelve light guns.				
·····	<u> </u>				•••••	· · · · · · · · · · · · · · · · · · ·	r r			

The great superiority of the Olympia over the Eclipse on every point of comparison cannot be attributed to the extra 200 tons displacement of the former; and the comparison is even yet more puzzling when we substitute the Armstrong cruiser for the Olympia. On 1.200 tons less displacement than the Eclipse, the Blanco Encalada carries a heavier armament at three knots higher speed.

The main battery of the Olympia, composed of four 8 inch and ten 5 inch breech loading rifles, is entirely on the main deck. The four 8 inch guns are mounted in pairs in two turrets of Harveyized steel 31/6 inches thick, revolving within barbettes of 4 inch nickel steel armor. Firing through an arc of 280 degrees and having an axial height of 22 feet, these guns have a great range of action, besides being unusually well protected from return fire.

The ten 5 inch guns, which are of the rapid fire type, are housed in armored sponsons four inches thick, and are so placed that they give a direct bow or stern fire from four guns and a broadside discharge on either side from five.

The secondary battery, composed principally of fourteen 6 pounder rapid fire guns, is stowed in armored sponsons on the berth deck and along the hammock berthing above the 5 inch guns, affording the greatest convenient range and command. The disposition of the 6 pounders on the berth deck is such that, while free from the flash of the main battery above, they may maintain a complete belt of fire around the ship. The six 1 pounders and the four Gatling guns, which constitute a minor phase of the secondary battery, are distributed in the fighting tops, and at .advantageous points on the bridges. There are five torpedo discharges; one at the bow, one at the stern, and two on each broadside.

From a commanding position just abaft and above the forward turret, the commanding officer, incased by five inches of nickel steel, will bring his ship into action; and the most modern means of communica-. tion bring every important point within immediate touch.

The principal dimensions are:

Length on water line	340	feet	•
Beam, extreme	53	**	
Draught, mean	21	46	6 inches.
Displacement, normal	<b>5,80</b> 0	tops	з.
Coal supply, normal.	400	**	
Coal supply, bunker capacity	,093	44	

The vessel has twin screws, each shaft being driven by its own vertical, triple-expansion engine. While not admitting strictly of comparison, the Olympia and the Minneapolis have engines individually alike, one II. having two sets and the other three. On trial, the Minneapolis developed 21,000 horse power, a proportion Winneapolis developed 21,000 horse power, a proportion engine than was realized by the larger craft.

The contract called for only 13,500; and the difference between that and the trial result is indicative of the wide margin of safety reserved by the government and upon which the contractors, at their own risk, are V I willing to encroach when a premium of \$50,000 is placed upon every quarter knot of speed in excess of contract requirements.

# Scientific

ESTABLISHED 1845

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#### (Established 1876)

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and steel makers VI. MILITARY SCIENCE. – The Italian Campaign in Abyssinia. – A full account of the military operations in Abyssinia, with

#### STABILITY OF LOFTY BUILDINGS.

Although the exaggerated vertical proportions of the modern office building render it, architecturally speaking, somewhat grotesque, there is no doubt but that the steel "skeleton" system upon which it is built provides all the necessary rigidity and strength. The vast areas of towering wall which these buildings present to the wind naturally raise the question of their ability to withstand the accumulated pressure which must result when they are exposed to a gale of any strength.

The vibration of lofty buildings has ever been a favorite theme with those who write in the field of engineering romance.

The party who, not so long ago, gravely assured the public that the lantern at the top of the Eiffel Tower swept to and fro through an arc of ten feet, in response to the fiercer gusts of a storm, was shortly afterward followed by another writer, whose pen, more given to fluency than to fact, wrote down a detailed account of the vibrations of a certain well known office building. which were described as being so severe as to stop the clocks on any but the lowest stories! Factory chim neys, church steeples, lofty monuments, and in fact every structure that raises its head much higher than its fellows to the buffeting of the elements, are locally credited with feats of more or less impossible vibration,

That tall factory chimneys do sway to and fro in a high wind, and that a poorly constructed building will rock, can be proved by careful instrumental tests, and in extreme cases the motion can perhaps be detected by the eye, but the frequency and extent to which such movements occur has been vastly exaggerated.

It would be natural to suppose that the elasticity of the steel framework of a fire proof building would allow of a certain amount of "give" or spring, under the severe bending stresses to which it is subjected by wind pressure.

We have been favored with the result of an instrumental test, which was recently carried out on the twenty-first floor of the American Surety building, Broadway, New York, by the engineer and superintendent of the building, Mr. J. Turner. It was made during the height of the heavy storm which prevailed during January 4, when an official wind velocity of 82 miles per hour was registered in the neighboring station. The test failed to give the slightest evidence of vibration; a result which agrees with the testimony of the inmates that in a gale the topmost floors are as still as the first stories. The test was made with transit and level, and though it was not a test of the highest instrumental character, the result was remarkable, for both the plumb bob and the bubble remained perfectly still, even when the building was struck by the heavier gusts of wind.

We confess to some surprise at this practically absolute rigidity; for the absence of any building on the opposite side of Broadway, and, indeed, on that part of the whole block which lies immediately in front of the Surety building, makes it certain that practically the full height, from curb to coping, was exposed to the shock of the storm. Just how great was the bending strain set up within the building is a matter of easy calculation. The front exposed to the wind is 84 feet 8 inches wide by 314 feet high, giving a total of 26,585 square feet. The wind pressure corresponding to 82 miles per hour is somewhat problematical, for, although experimentalists have discredited Smeaton's formulæ, they have given us no substitute upon which they are well agreed among themselves. Smeaton gives 31 pounds per square foot as the pressure corresponding to 80 miles per hour. This is undoubtedly too high. Prof. Martin's formula, pressure =  $0.004V^2$ , works out at about 25 pounds to the square foot, which we will assume to have been maximum pressure on this occasion.

This gives a pressure on the whole front of 332 tons; and a bending or overturning moment of over 52,000 foot tons. These figures give us an impressive idea of the solidity of a construction which proves to be quite insensible to such powerful disturbing forces. It must be due to the combination of a thoroughly well

Miscellaneous Notes.

It has been suggested that the boards of health of large cities require the wheels of all milk wagons to be VI equipped with rubber tires.

A car load of redwood has been recently sent to Nuremberg, Germany, for use in making lead pencils. California redwood and cedar are about the only in woods used in the manufacture of pencils, and the  $\mathbf{x}$ . European forests, from which the pencil wood supply was formerly obtained, have become exhausted.

The Albert Levy prize, of the value of \$10,000, has been awarded by the Academy of Medicine to Drs. Behring, of Berlin, and Roux, sub-director of the x Pasteur Institute in Paris, for their discovery of the means of curing diphtheria.

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riveted steel structure with the inertia and rigidity of massive walling, into which it is tied and built.

#### REPORT ON THE PLANS FOR NEW YORK RAPID TRANSIT.

The Supreme Court Commission, consisting of Frederic R. Coudert, George Sherman, and William H. Gelshenan, which was appointed to examine and pass upon the plans of the New York Rapid Transit Commission, has reported unequivocally in favor of the construction of the underground railroad on the lines proposed by Engineer Wm. B. Parsons.

It is evident, from the general tone of the report that they have judged the question as to whether the tunnel should or should not be built from the standpoint of general expediency, having in view the greatest good of the greatest number. The question which the commission set itself to answer was, whether the necessity for increased transit facilities existed and, if so, whether the proposed scheme would meet the  that the benefit conferred upon the public at large the greatly enlarged accommodation which the will vastly outweigh any temporary and local incon-operation of this law will demand. venience. With regard to the discrepancy between the estimate of \$50,000,000 for the total cost by Mr. Parsons and the \$80,000,000 estimated by engineers who testified for the protesting property owners, the American Publishers' Copyright League, the following be better brought about under the provisions of the report says: "In the view of your commission, it is not resolutions were presented and adopted : necessary to determine whether the road will cost \$50,-000,000 or \$90,000,000. We are convinced that, if the right League disapprove, on the following grounds, of road can be built at a reasonable cost, it ought to be the provisions of the bill introduced in the House of built. We are equally convinced that we can never Representatives by Mr. Treloar (H. R. 5,976) for the reknow whether it can so be built until an opportunity vision of the copyright law: is given to competent contractors to sav whether they will or will not undertake the construction of the of the United States" of the privilege of securing copyroad."

think that this is one of the cases where the public in- of 1870 had limited the privilege of securing copyright unfavorable action of the Congress and of the executerest cannot be barred in its progress by any regard to persons who were "residents" of the United States. tive. for persons where a violation of the lawis not involved. The restriction now proposed, limiting the copyright taken, the hardship of the case cannot be suffered to have been entered into by the United States under bureau for the registration of copyrights. interfere: the demands and the comfort of 2,000,000 the act of 1891 with Great Britain, France, Gerpeople must be heeded."

to whether the roads would pay, the commission sees back of the policy of even our most primitive copyright no reason to doubt that they will. "Our invariable laws in the recognition of literary and artistic proexperience," they say, "thus far has been that the perty. facilities for transit never increase so rapidly as to meet the growing necessities of travel." The commissioners articles which, in order to secure the privilege of copyare prepared to admit that when the road is built trav- right in the United States, must be wholly manufacelers may at first be prejudiced "against a system tured within the limits of the United States, of musiwhich compels them to go down a long flight of steps cal compositions, and of reproductions of works of art and to hide themselves from the sunshine and the open in the form of engravings, cuts, or prints. In the disair for a given length of time" In regard to this ob cussions of the provisions of the act of 1891, it was held jection. we have already pointed out in a previous by those having expert knowledge of the subject that issue that it would probably exist at the outset; but the application of the manufacturing requirement to we are, at the same time, of the opinion that, if the the production of foreign musical composers would in tunnel could be built and the proposed speed of oper-practice prevent such composers, in the majority of ation maintained. the New York public would ulti-mately smother its sentimental objections in the face and would simply perpetuate the practice previously of the solid practical benefits which such a scheme existing of the appropriation by American reprinters would bestow.

by a commission of such great ability and high personal requiring the manufactureor production in the United character is certain very materially to hasten its exe- States of an engraving of a work of art by a foreign cution; but it seems likely, on the other hand, that designer must, in the majority of instances (and particuthe legal complications in which the opponents of the larly in the cases of the more important works of art Commission will endeavor to involve the proceedings which could not be brought across the Atlantic for the will bring about a delay which may prove to be of  $\mu$  purpose of being engraved), render impracticable the considerable duration. When the legal objections securing of American copyright, and would leave have been swept away (supposing, as the commission open, as heretofore, the property in such reproducconsider, that they are invalid), there will remain a tions to be appropriated by unauthorized publishers. period of five years which must elapse before the roads can be put in operation.

may possibly be six or seven years distant, what pro-'guage of the country of their origin, the authors of vision is to be made for relief of the existing over- France, Germany and Spain have thus far received crowding, not to mention the additional increase in but inconsiderable advantage from the American Burgos three fragments fell among the houses. Other travel which is certain to take place in each year of copyright act, although the several nations which the interim? We understand that the Rapid Transit have entered into copyright relations with the United Commission invited the elevated roads to make a state- States have extended to our citizens, without any rement as to what they were prepared to do in the way strictions of local manufacture, the full copyright of extension; but although they appeared before the privileges enjoyed by their own citizens. This result commission of 1891, at the present writing they have has naturally brought about, on the part of the namade no application or response to the existing com- tions referred to, a large measure of dissatisfaction mission of 1894.

the special commission is right in stating that this is minated (greatly to the disadvantage of American the first consideration), the extension of the existing authors and artists) if it had not been for certain adelevated roads, and the construction of the Broadway vantages secured under the act of 1891 to the foreign tunnel, should be regarded as parts of one general producers of works of art. If the protection of Amerischeme. A scheme which contemplates the provision can copyright is to be withdrawn also from the proof the New York lines of travel with ample seating ductions of foreign artists (as would be the result un-in it about four inches long; a metal skate key; a brass capacity at all hours of the day must necessarily em- der the Treloarbill), international copyright relations door key, five inches long; a woman's black horn brace both enterprises. From 1884 to 1893 the travel between the United States and the nations above comb; two pieces of coal; a woman's silk handkeron the elevated roads increased 250 per cent, and this specified will inevitably be brought to a close.

A NEW COPYRIGHT BILL.

Resolved, That the American Publishers' Copy-

1. The bill provides for the restriction to "citizens many, Italy, Belgium, Switzerland, Spain, Portugal Regarding the apparently all important question as and Denmark, and would constitute a distinct step

2. The bill provides for the addition to the list of of the property in such productions. It was further The strong indorsement of the rapid transit scheme established, during this discussion, that a condition

In connection with the difficulties in the way of securing simultaneous publication in the United States Pending the arrival of the day of opening, which for editions of Continental books printed in the lanwith their copyright relations with the United States. As far as the needs of the public are concerned (and and these relations would before now have been ter-

which would outweigh any possible temporary or per- to their contract and give him the seat for which he that the staff provided under the Treloar bill for the manent disadvantages which might attend its execu- has paid. In estimating the future transportation Copyright Bureau would be unnecessarily large and tion. They decided that the necessity exists, and necessities of New York, provision must be made for expensive, and that the services of so many employes would probably not be required, at least during the earlier years of the operation of the office.

5. The purpose expressed in Clause XXVIII of the

bill for securing adequate protection for the property At a meeting of the executive committee of the rights of dramatic authors can also, in our judgment, Cummings bill now pending in the House of Representatives.

For these several considerations it is our judgment that the enactment of the Treloar bill would constitute a serious injury to the rights of producers of copyright property and to the interests of the community for the use of which such copyright property is brought into existence. It would further constitute, on the right under the statute. The act of 1891 extended the part of the United States, a breach of international Regarding the encroachment by the tunnel upon the privilege of securing copyright within the United good faith with the several nations of Europe that sidewalk vaults and the question of possible damage States to the citizens of foreign states which conceded have extended copyright privileges to American citito existing structures, the commissioners say: "We to American citizens the benefit of copyright. The act zens. We therefore ask that the bill may receive the

A resolution was passed, however, approving the If the owners have no law in their favor, and if the privilege to citizens, would bring about a revoca- bill in the House by Mr. Bankhead and in the Senate public convenience demands that the vaults shall be tion or cancelation of the copyright relations which by Senator Morrill for the establishment of a separate

#### Spain's Big Meteorite.

In our issue of February 22 we called attention to the bursting of a great aerolite over Madrid on February 10. The Spanish newspapers have now reached this country and give full details of the event. This phenomenon is seldom observed on so startling a scale. The sky was cloudless, the streets were just beginning to be thronged with traffic and pedestrians, when the deafening sound of the explosion was heard. Those who happened to be looking at the sky say that the instant of the explosion there was a vivid glare of blinding light that for the moment outshone the sun, and then there instantly appeared at the place where the disturbance originated what looked like a cloud of white and bluish tint, bordered with red, which moved east at a tremendous rate leaving behind a thin train illumined by the sun that may have been dust particles. The whole city appeared to be shaken as if by an earthquake, and the agitation of the atmosphere was shown by the rapid fall and rise of the barometer. The terror inspired by the occurrence was very great, particularly among theignorant and superstitious. Many people did not recognize the origin of the phenomenon and thought some terrible catastrophe had occurred. The energy of the disturbance probably equaled that of the explosion of a large powder magazine. Many windows were shattered and walls injured, but fortunately no one was killed. The aerolite was visible over at least three-fourths of Spain as it shot through the air above the peninsula. Some damage was done at places along its route, for the great meteorite partly disintegrated on its way and the incandescent fragments that showered upon the town of Lograno set two buildings on fire. and at pieces of the stone that were flung off near Madrid were picked up while still hot.

#### -----

#### The Marvels of an Ostrich's Stomach.

The post mortem examination of one of the flock of ostriches owned by Barnum & Bailey, which has been on exhibition at the Central Park menagerie. New York City, gave the spectators a wonderful object lesson of the digestive capabilities of an ostrich. The ostrich was dissected by a taxidermist. He found the following articles in the bird's stomach: One wooden clothes pin; the bottoms of two beer bottles; a mouth harmonica, five inches long and two inches wide; a ferrule of an umbrella with a piece of the stick chief + three stones shout an inch thick. with some cabbage, grass, lettuce, celery and considerable dirt. Strange to say, the ostrich did not die of indigestion, but from tuberculosis. The bird will be mounted in the museum and it would be interesting to preserve alongside the collection of objects which was found in its stomach.

vear preceding.

probable needs of the future no calculation can be would enable him to pay such a penalty as that proconsidered reliable which is not based upon seating vided for, and still secure a satisfactory return from his capacity. Statements of the number of people which undertaking. The penalty should be left, as under the a road can carry from a given station in a given time present law, proportioned to the extent of the injury are often worthless, for the reason that 30 or even 50 caused to the owner of the copyright, and proporper cent of this number may be standing passengers.

If to-morrow the elevated roads and the Broadway cars were obliged by law to hang out the French sign have been diverted from the rightful owner. "Complet," as they do in Paris, when all seats were

in spite of the fact that in the same interval there was 3. The provision in the bill under which the total a rapid increase in the travel upon the competing sur- amount to be collected for the infringement of the face roads. Statistics show that the rate of travel in- copyright of a literary production is limited to \$5,000 creases faster than the population; that is to say that is inequitable in itself, and constitutes a distinct denot only are there more people to travel, but each parture from the principles heretofore controlling the person takes more trips each year than he did in the law of copyright throughout the world. An unauthorized reprinter might easily secure, through the It should be borne in mind that in estimating the appropriation of copyrighted work, proceeds which

tioned also to the proceeds secured to the person appropriating the copyrighted property, which proceeds

4. The plan for instituting the office of Commissioner filled, what would become of the morning and evening of Copyrights can, in our judgment, be dealt with travel? Yet the passage of such a law would be mere- more effectively in a separate bill, such as has already in the SCIENTIFIC AMERICAN last week. The disease ly the recognition of the right of a passenger to de-been introduced in the House by Mr. Bankhead and of which he died was of but ten days' duration, and mand that the transportation companies shall live up in the Senate by Mr. Morrill. It is further our opinion was contracted while doing compass duty.



Lieut. Babcock, executive officer of the U.S. revenue cutter Michigan, died of pneumonia at the University Club, New York, on March 11. He was born in Vermont, in 1853, was graduated at Annapolis in 1871, and from that time had been continuously in the naval service. He served under Capt. Rogers, inspector of this lighthouse district, and was largely instrumental in establishing the electric light buoy system of New York Harbor, which was illustrated and described