

without the corresponding disadvantage of either. Mr. Wilson's system consists in a plate made of layers of steel and iron united by fusion. The plate is 9 inches thick, having steel on the outer face to the depth of 5 inches, the remainder being wrought iron. Tests made of this armor have shown that it breaks the shot of 7 inch guns while splitting and starting through its steel portion, but that the latter is held together by the iron.

Sir Joseph Whitworth has invented a new plate constructed on a different principle, which consists of a solid shield of comparatively soft steel, in drilled holes in which plugs of harder steel of high quality are inserted. These plugs are very closely distributed over the plate, and their object is to break the projectile and to prevent the extension of star cracks. This plate has also been fired at and has stood well. A competitive trial of the two systems has recently been made in England, which has led to no very definite results owing to the inferior manufacture of some of the competing plates, but the general indications go to show advantages in the compound steel and iron shield.

CONFIDENTIALLY, WITH OUR READERS.

At this season of the year very many of our subscribers in renewing their subscriptions take occasion to express their opinion of our journals. We are always glad to receive these comments—in fact, it invariably affords us gratification to hear from any of our subscribers on any subject within the scope of our field which interests them; but we take, perhaps, more especial pleasure in noting the criticisms or praises which those to whom our work is addressed bestow upon it. Whether the opinions be adverse or otherwise, they indicate something more than a mere passing interest, and evidence a degree of appreciation which goes to prove that our efforts are regarded, at least, as intended to be beneficial far beyond the affording of temporary entertainment through the presentation of merely what is new in the great world of science and mechanical industry. It so happens, however, that adverse criticism rarely—very rarely—finds place in the letters we receive. Once in a while we receive a "hauling over the coals," but we can see the good nature under it all, although occasionally we are tempted to point out that a paper run to suit each individual preference would probably satisfy nobody, not to mention the fact that it would have to be a colossal publication to contain all we are asked to insert. Besides, and although we are quite willing to admit that many of our excellent readers who send us their strictures are much more capable to conduct the SCIENTIFIC AMERICAN than we are, still, while that task is left in our hands, a conscientious sense of duty impels us to continue our possibly mistaken course by the light of the thirty odd years' experience we have had in doing so.

As for commendatory letters, which are brimful of kindness and good wishes, and which abound in such praises that really our innate modesty sternly prohibits our publishing them, their number is legion. They come in the plain words of men who know far better how to produce marvels with the hammer and chisel than with the pen, and in the earnest language of workers in science who stand foremost among intellectual minds. Inventors, mechanics, men of business, and professional men—in a word, the true brain and muscle of the country unite in these encomiums, and afford us encouragement such as would spur even the least appreciative to constantly improving efforts.

We shall make an extract from but one of these letters—and it may stand as a type of all—and this because it expresses the unsought opinion of an engineer whose achievements are so well known that every body will respect his judgment. After renewing his double subscription to both of our journals, Captain Eads says:

"I heard one of the most eminent engineers of the United States Army declare in the presence of several other highly intelligent gentlemen, a few months ago, that he considered the SCIENTIFIC AMERICAN to be the best scientific journal published in America. To this there was no dissent among those who heard him. It is my own opinion; and wishing you continued success, I remain,

Very sincerely yours,
JAS. B. EADS."

GOVERNMENT TESTS OF MAGAZINE GUNS.

A board of army officers, under the presidency of Lieut. Colonel J. G. Benton, is to convene at the Armory, in Springfield, Mass., on the 3d of April next, for the purpose of testing magazine guns. Inventors will soon be requested by the Secretary of War to provide sample arms for trial, all guns to be of caliber 45, the same as that of the Springfield rifle now in use, and to carry the United States service cartridge. It is stated that the Secretary is authorized to spend \$20,000 in the conducting of these tests. The board will probably be in session until midsummer. No special rules governing the trials have yet been decided upon, and Lieut. Colonel Benton informs us that probably none will be made until the board convenes.

The terrible execution done by the magazine gun during the present Russo-Turkish war has shown the superiority of that weapon over the single fire breech loader, and indicated the prominent part which it is destined to take in future conflicts. The main requirement is now to simplify the gun, to reduce the number of parts, and render their interconnection so plain that the soldier can easily take the weapon apart or put it together, and make his own repairs on the field. We shall probably publish full descriptions of the competing weapons when the test begins.

A REMARKABLE AND DISASTROUS EXPLOSION.

At about 5 P.M. on December 20th last, the throngs of people who were passing through Barclay street, in this city, near Broadway, on their way to and from the New Jersey ferry, were horror-stricken to behold the entire front of a large five story building fall into the street. The dull sound of an explosion was simultaneously heard, portions of the ruined edifice were hurled against buildings many feet distant, and almost instantly a fire broke out which speedily consumed a large part of the block. Twelve persons were killed, others are still reported missing, and many were wounded. The structure was used by the Messrs. Greenfield as a candy manufactory, and work was in full progress, owing to the holiday season, when the disaster occurred.

The prevailing impression at first was that a boiler explosion had taken place, but examination of the generators proved this not to be true. Numerous other theories have since been suggested, including illuminating gas explosion, formation of an explosive mixture of carbonic oxide and air in the flues from the boiler, explosion of chemicals, and others. A correspondent sends us the following interesting letter on the subject, which suggests a very plausible and probably the true cause of the casualty. The fire authorities and other official investigators have thus far failed to reach any definite conclusion on the subject. Our correspondent says:

The cause of the Barclay street fire still remains a mystery, and it having been proved beyond reasonable doubt that neither steam, gas, nor kerosene caused the catastrophe, the experts appear to have lost the scent, and are now following the hunt with blind uncertainty as to the direction they should next follow.

It may therefore be convenient at this moment to mention certain conditions that may result in explosions among substances usually regarded as perfectly harmless.

It is perhaps not generally known that many substances when reduced to a very fine powder, and thus diffused in the air of a room, will under certain conditions explode with terrific force. Among other substances may be mentioned cork. This material, which burns in bulk with a very slow combustion, becomes highly explosive when reduced to an impalpable powder and in this state distributed in an atmosphere.

The Linoleum Company of Staten Island have had unpleasant proof of this fact. In the manufacture of linoleum, cork in a very fine powder is employed to a large extent, and in its manipulation becomes dispersed about the room, causing the air to become highly charged with it.

Not very long since, the cork in one of their rooms exploded with great force, blowing off the roof of the building. On this occasion the ceiling in the room where the explosion took place remained intact, the whole force of the explosion passing through an opening in the ceiling to the room above, the roof of which chamber was carried away.

It should be noticed in this instance that the explosion traveled to the spot which presented the least resistance, and that the damage occurred in a room that was not the scene of the original explosion.

This experience may be useful in directing attention to new channels of inquiry in regard to the Barclay street fire; it certainly offers two links that may be followed with advantage, for it teaches us in the first instance, that the cause of an explosion may be remote from the spot where its effects were most apparent, and secondly that explosions may result from substances which are not within the category of explosive compounds. The subject might be carried one step further by making the inquiry whether any substances used in the candy manufactory could explode under the same conditions as the cork, but that is a matter to be handled by those making the investigation.

There is also another point that has passed unnoticed. Candy manufacturers at Christmas time make a large number of pull-crackers, folded in fancy papers with candy. What quantity of detonating powder was held at the time of the explosion?

These remarks are merely suggestive, and as such may be valuable in giving a wider range to the present inquiry, there appearing a desire to force the conclusion that the building must have fallen down if not blown up by steam, gas, or kerosene. J. M.

THE AMERICAN EXHIBIT AT THE PARIS EXPOSITION.

Commissioner General McCormick, on January 10th, stopped the reception of applications for space at the Paris Exposition, and none further are to be entertained. It is stated that 625 applications have been made, the majority coming from Pennsylvania and from this State. Fully five times the amount of space allotted to the United States has been asked for by exhibitors, so that it is therefore a certainty that disappointed applicants will be in the majority. The Commissioner General has full control in the matter of selection, and his decision is final. He is proceeding rapidly with the consideration of applications, and his selections will shortly be made known.

New Fast War Steamer.

The Iris has been constructed as a twin-screw dispatch steamer for the English Government. At a recent trial trip of six hours' full power run, which extended to about 120 knots, 96 were completed during the official six hours. The mean pressure of steam in the boilers was 62 lbs. The starboard engine made 91 and the port engine 89½ revolutions per minute. The mean total horse power developed was

7088.52, the contract being for 7000. Sixteen knots per hour was the speed attained; consumption of coal was 2.7 lbs. per indicated horse power per hour. The following are the principal dimensions of the Iris: Length between perpendiculars, 300 feet; over all, 333 feet; extreme length, 46 feet 1 inch; depth in hold, 16 feet 3 inches. The armament is to consist of ten 64-pounders. She is bark-rigged with wooden masts, and is steered by hand gear. The ship is propelled by direct-acting, horizontal, compound four-cylinder engines, designed to turn twin screws. There are four high pressure cylinders, having a diameter of 41 inches, and four low pressure cylinders, with a diameter of 75 inches, the stroke being 3 feet. Steam is furnished by twelve boilers of slightly different dimensions. The total weight of the machinery, with water in the boilers and condensers, is about 1,000 tons. The contract price is £93,000. The engines have been manufactured by Messrs. Maudslay, Sons & Field. At the trial trip the mean draught of the vessel was 15 feet 8 inches forward and 20 feet 7 inches aft.

Keely or a Rival.

The "Bradley Promethor," says a Baltimore contemporary, is a vessel propelled by "a certain kind of gas, which is evolved by mechanical disintegration, the water being forced through solid silver by hydrostatic pressure, which is automatic and is operated by the engine. This product is introduced into small cells of one inch internal diameter, made of the best decarbonized steel, and there quickened into gas by heat, which does not need to be over the ordinary temperature to produce steam. There is no water introduced as water into the generators.

"The apparatus, he claims, contains nothing but pure gas, without any likeness to a steam boiler. Three hundred pounds pressure can be had from a thimbleful of water, and the pressure can be raised any degree to thousands of pounds to the square inch by regulating the supply of water. The gas frequently reaches so intense a state as to show great signs of electrical action, but before being admitted to the cylinder of the engine it is oxidized, which fully prepares it to act with all the smoothness of steam on the piston."

We are not sure but that this is a bare-faced infringement on Keely's great conception, though the remarkable discoveries which the inventor (or the writer of this description) appears to have made incline us to the belief that the Keely brain has here also been at work. No one else is so competent as he to wrench from unwilling Nature the great truths of the aqua-disintegrating properties of solid silver, the smooth behavior of oxidized gas, or to accomplish the wholly unparalleled feat of producing "pure gas without any likeness to a steam boiler."

Water Supply of New York City.

From the report of the Department of Public Works of this city, Mr. Allan Campbell, C. E., Commissioner, it appears that the total amount expended for works, structures, aqueducts, pipes, etc., connected with the water supply for the city, including maintenance and repairs, from the period of its inception in 1842 to October 1, 1877, has been \$34,692,103.73; the total revenue, \$30,105,338.80. Cost over revenue, \$4,586,764.93. The growth of the city has rendered an increase in the size and arrangement of the distributing mains necessary. Under a recent contract, straight pipe of the very best quality has been procured at \$22.75 per ton of 2,240 lbs., probably the lowest price at which such pipe was ever brought to this city. This unexampled low price of iron pipe makes it very desirable that the necessary additions and alterations should be made at the present time. Small mains of former years will in course of time be replaced by large ones on the principal streets and avenues, and in connection therewith a sufficient number of fire hydrants will be added. The report maintains that the supply from the Croton river system, including the Housatonic river, is the proper mode to be pursued. This plan contemplates an additional aqueduct, when increasing population shall have taxed the present one to its fullest capacity.

A "Momentum" Torpedo.

Commodore John A. Howell, U.S.N., has invented a new movable torpedo, which is driven by the energy stored up in a heavy rotating wheel in its interior. The apparatus is a cylinder with two conical ends, and at each extremity is a two-bladed screw. Inside beside the fly wheel is the explosive charge. By an outside gear wheel on the screw shaft, which connects with a motor on board ship, the fly wheel is set rotating; then the contrivance is slid down a boom and into the water, it being supposed that the momentum of the fly wheel will keep the screws rotating long enough to drive the machine ahead for 300 feet or so, in a straight line. Recent trials at Newport were unsuccessful, the rudder not acting well and the torpedo going in every direction but the right one.

TO OUR SUBSCRIBERS.

We find ourselves obliged to ask the indulgence of those of our readers who have lately failed to receive their numbers of the SCIENTIFIC AMERICAN with usual promptness. This is the season of the year when most new subscribers remit and old ones by the thousand renew, and the demand for papers is always excessive. Of late, however, the inflow of subscriptions has been even greater than usual, and our regular editions have been quickly exhausted. We are rapidly reprinting recent issues, so that our patrons may rely on receiving their numbers at the earliest possible moment.