Correspondence.

Heavy Rapid-Fire Guns.

To the Editor of the Scientific American:

I have read with interest a recent letter from a correspondent in your valued paper in which the batteries of our new armored and protected cruisers are contrasted unfavorably with those of similar craft in the Italian and Japanese navies. The same correspondent adds that no such criticism applies to the armament of the new battleships. So far as the number and weight of the guns is concerned this last statement is doubtless true. In this respect the ships of the "Pennsylvania" class seem rather overgunned than otherwise. A question arises, however, concerning the comparative efficiency of the eight 8-inch guns which form a part of these batteries. These are all listed officially as "breech-loading rifles." I have noticed, however, that all guns of this caliber in foreign navies are classed as "rapid-fire guns," while there are no guns of this classification in our navy above the caliber of six inches. On the other hand the Scientific American has stated that all of the guns in our new battleships are to have the improved Weling breech mechanism, which will presumably make them as efficient as any. The question that arises is this: Is the difference between the new 8-inch "breech-loading rifles" of our navy and the 8-inch "rapid-fire guns" of foreign navies merely one of nomenclature, or is it true that we are still clinging to the old slow-fire principle in guns of this caliber despite the fact that this practice has been universally abandoned in foreign countries? I request that the Scientific American furnish its readers with an answer to this question. A. C. Reiley.

2682 Broadway, New York.

[The new 8-inch naval gun is entitled to be called a rapid-fire weapon. It embodies the rapid-fire features which are found in the European rapid-fire pieces of the largest caliber.—Ed.]

Quartz Fibers with the Electric Arc.

To the Editor of the Scientific American:

Quartz fibers of small and uniform diameters fit to be used for galvanometer suspension or cross hairs in telescopes or transits can be made only with the aid of heat of sufficient intensity to liquefy the quartz. The usual source of heat is the oxyhydrogen blowpipe, but it quite often happens that this apparatus, with its cumbersome gas cylinders, are not at hand when the fibers are most needed, with the result that the experimenter or observer often contents himself with a spider-web cross hair or a suspension of unspun silk, which are both unreliable and short-lived. The writer has found this quite unnecessary if an ordinary electric arc is accessible. The arc is preferably provided with a hand-feed, but the ordinary automatic feed may be so adjusted as to give a gap of about one-fourth of an inch. A crystal of transparent quartz should now be brought near to but not within the zone of incandescent gas, and held in this position till it is thoroughly heated. If heated too rapidly the crystal will chip and the fragments be thrown about with violence. After heating, the crystal may be brought in contact with the incandescent spot on the lower carbon and a piece about the size of a kernel of wheat melted off. This should be seized with a pair of forceps and drawn out to a length of about half an inch as it is removed from the carbon. Another piece of quartz similar in size is now melted on the carbon, and after it has become quite liquid the quartz already melted should be brought in contact with the bead and quickly withdrawn. If the movement is rapid and the direction of the pull is not such as to draw the thread across the column of heated gas, a very fine fiber of uniform diameter will be the result. Much depends upon the quickness with which the fiber is drawn out, and any scheme to increase this will improve the results.

If the operator stands on a well-insulated platform there need be no fear of the current.

Marinette, Wis. Clarence W. Eastman.

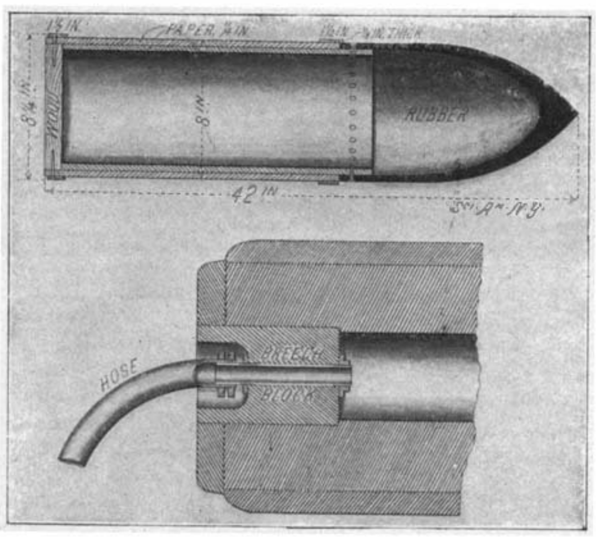
[The experimenter is warned against trying this experiment on a lamp placed on a circuit having more than 100 or 200 volts E. M. F.—Ed.]

A new extensometer has been designed by Mr. H. T. Bovey, for determining the longitudinal extension or compression of any given length of a horizontal beam loaded transversely. It was recently described in the Transactions of the Royal Society of Canada, and consists essentially of two parallel overlapping steel bars, the opposite ends of which rest by knife blades against two points on the specimen to be measured. Between the faces of the two bars is a small roller carrying a mirror. An extension or compression of the specimen causes relative motion of the bars rotating the roller through a small angle, which is readily observed by means of the mirror, the reading being effected by means of an ordinary telescope with cross hairs.

SHELL PRACTICE IN CITY ARMORIES.

In the large Armory of the Thirteenth Regiment, Brooklyn, there are mounted complete working models of three types of coast-defense guns, a 12-inch mortar, an 8-inch disappearing rifle, and a 4-inch rapid-fire gun, which were built especially for the Armory by the Bethlehem Steel Company at a cost of $25,000. They are perfect working models, and the dimensions, form, and functions of every part are exactly the same as in the army guns installed in coast fortifications, the only difference being that the models, which are built chiefly of wood, are very much lighter than service pieces, and, of course, cannot be fired with powder charges. But since the traversing and elevating mechanism and the mechanism of the breech of the gun are of metal and identical in design with the service gun, it follows that the gun detachments secure the full benefit of drill with the actual guns in handling these models.

It occurred to Lieutenant Kingsley L. Martin, who is one of the civil engineers in charge of the construction of the new East River Bridge, that the value of the gun drill, to say nothing of its interest, would be greatly increased if the weapons could be arranged to fire dummy shells at actual targets in the Armory. Powder was impracticable for three reasons: First, that there would be danger of cracking the thin cast-iron linings which are inserted in the dummy guns to carry the rifling; secondly, that the concussion and noise of the discharge would be undesirable and dangerous to the glass windows and lighter structures of the Armory; thirdly, that no projectile that would withstand the shock of powder discharge could be made so light as not to injure the Armory floor when it fell. Accordingly, with the sanction and encouragement of Colonel David E. Austen, commanding officer of the Regiment, Mr. Martin designed and had built the plant which forms the subject of our illustrations.



DETAILS OF DUMMY SHELL AND COMPRESSED AIR ATTACHMENTS AT BREECH OF 8-INCH GUN.

Compressed air was selected as the substitute for powder most suited to the case. This was furnished by an electrically-driven, direct-connected compressor with an automatic governor. The air is stored in a series of flasks and in the large 6-inch main which runs around the building below the galleries, at a pressure of 130 pounds to the square inch. The compressor runs until the desired pressure is reached, when the governor cuts off the current. When the gun is fired the resulting drop of pressure, acting through the governor, starts the compressor and renews the supply of air.

The compressed air is led into the powder chamber through the breech-block in the manner shown in our illustration. The mushroom head and the spindle were removed from the breech-block and a 2-inch pipe threaded at its ends was introduced in place of the spindle, and an air-tight connection made by screwing up a pair of flanges tightly against the front and rear faces of the breech-block. To the outer end of this pipe a length of fire-engine hose was attached by means of a couple of clamps, the other end of the hose being connected to the compressed air main. When the order to fire the gun is given, a quick-opening gate valve admits the air instantly to the gun.

The first projectiles used were cylindrical with flat heads, but for the future, pointed heads of molded rubber, of the kind shown in our illustration, will be substituted. In the earlier projectiles, the body was made of rubber belting for the 8-inch and of leather for the 12-inch gun, the heads and bases consisting of cup leathers. The 4-inch shells were paper tubes with wooden disks at the ends and a felt rifling band. The new 8-inch shell, shown in our engraving, consists of two cylinders of paper each one-quarter of an inch in thickness, with a disk of wood at the base, and with the overlapping pointed rubber head riveted to the inner cylinder, as shown. As we have already stated, the guns are fitted with a half-inch liner, in which the rifling is cut. The rifling band in the case of the dummy shells consists of a strip of felt or leather, and it was found that this answered admirably.

In a recent trial of the guns, the gun crews were taken from the Third Battalion of the Regiment. Base lines and stations had been previously established, and the azimuth, plotting-board, and range-finder were used in getting the proper elevation, etc., just as they would be in actual service. The stations were connected by telephone and also signal flags, wielded by members of the signal detachment of the regiment, were used as a means of communication. Twenty shots were fired from the larger guns and twenty from the 4-inch rapid-fire gun, the majority of which were hits; and this in spite of the fact that the target was moved and the angles frequently changed. Encouraged by the success of the installation, Colonel Austen is endeavoring to secure an appropriation of $1,000 for a permanent equipment.

A. L. Barber's Steam Turbine Yacht.

Up to the present time, the turbine has been applied to only four vessels by European shipbuilders—first to the torpedo-boat destroyer "Turbinia," then to the destroyers "Viper" and "Cobra," belonging to the British navy, and, lastly, to the passenger steamer "King Edward," which was finished on the Clyde in July, 1901, and used as an excursion boat between Glasgow and Campbelltown during the summer. This vessel is 250 feet in length between perpendiculars, 30 feet in molded breadth, and 17 feet 9 inches in depth, molded to promenade deck. In nearly all respects she is similar to the usual modern type of river or coasting pleasure steamer, only slight changes having been introduced to suit turbine machinery, which consists of three separate turbines driving three screw shafts. The speed obtained by the "King Edward" was about 20 knots.

The first order received by any British shipbuilder for a turbine yacht has come from an American—Mr. A. L. Barber of New York. Messrs. Ramage & Ferguson of Leith are building this yacht to the design of Messrs. Cox & King, of London. She will be 252 feet 3 inches on the water line (about 300 feet over all) with 32 feet 6 inches beam and a molded depth of 21 feet.

The turbine machinery will not be materially different from that of the "King Edward," in which the high-pressure turbine is placed on the center shaft, carrying one propeller, and the two low-pressure turbines each drive one of the outer shafts, each of these shafts carrying two propellers. In the exhaust ends of each of the latter are the two astern turbines, which are in one of the low-pressure motors, and operate by reversing the direction of rotation of the low-pressure motors and outside shafts. When the vessel is going ahead, the steam from the boilers is admitted to the high-pressure turbine, and after expanding about five-fold it passes to the low-pressure turbines, is further expanded in them twenty-five fold, and then passes to the condensers, the total expansion ratio being estimated at 120-fold. It is said that at 20 knots the revolutions of the central shaft are 700 and of the outer shafts 1,000 per minute. Only the outer shafts are used when going alongside of a wharf, and the steam is admitted by suitable valves directly into the low-pressure motors or into the reversing motors on each side of the vessel.

The yacht will have an indicated horse power of 2,500. As to the speed expected to be obtained, the designers will say no more than it will not be less than 16 knots. In regard to the coal consumption of turbine engines per indicated horse power, as compared with ordinary engines, there seems to be some uncertainty. In this respect the "King Edward" on her trips last summer was fairly economical, but this test is hardly a satisfactory one in arriving at the probable coal consumption of a turbine yacht, for the "King Edward" ran continuously at high pressure from Glasgow to Campbelltown and return, whereas a yacht on a cruise will steam at varying rates of speed.

This turbine yacht will be completed in about ten months.

The Current Supplement.

The front page of the current Supplement, No. 1369, is devoted to a brief account of the Victor Hugo centenary at Paris. Chemists will find an interesting article on the stratification of hydrogen by Sir William Crookes. The new Bermuda floating dock is fully described and pictured. John Meikle discourses interestingly on "A Bit of 'Ancient' History of the Isthmian Canal Problem." Among other articles may be mentioned a description of the Prince Regent Theater at Munich; the machinery of the Wagner Siegfried performance; and the "Padlocks of Indian Chests." Prof. S. P. Langley and F. W. Very describe the cheapest form of light, which happens to be that of the insect *Pyrophorus noctilucus*.