### THE PECOS RIVER BRIDGE.

One of the two or three highest bridges in the world is the viaduct over the Pecos River, Texas, which was completed last year, and is shown in our first page illustration. It is on the line of the Southern Pacific Railway, and its construction shortens the former line of the road by 11·2 miles, besides saving some heavy grades and avoiding bad curves. The bridge is 130 feet longer than the famous Kinzua viaduct, built in 1882, and 18 feet higher, while its longest span is 185 feet, against a span of only 61 feet as the longest in the Kinzua structure. A somewhat higher and similar bridge is the Loa viaduct, erected in Bolivia in 1889, but the longest span of the Loa structure is only 80 feet, and its total length but 800 feet, the height being 336 feet.

The Pecos River bridge is 2,180 feet long between abutment walls, and it is built of plate and lattice girders resting on steel towers. There are 34 tower plate girder spans, each 35 feet long; one plate girder span 54 feet long; eight latticed spans 65 feet long; two cantilevers 102 feet 6 inches long each; two cantilevers 70 feet long each, and one suspended span 80 feet long. The height from the base of the rails to the surface of the water is 320 feet 10¾ inches, and to the bed of the river is 330 feet. It has 23 supporting towers, all but the two supporting the cantilevers being built of steel Z-bars. All of the towers rest on cut stone piers, some of the piers in the bottom of the gorge being carried down 30 to 40 feet to bed-rock. The anchorages for the tower feet carrying the cantilevers and the shore arms for the cantilevers were built into the piers; but for the other towers the anchor bolts were set in Portland cement mortar after the completion of the piers. A wind pressure of 50 pounds per square foot is provided for with the structure unloaded, and 30 pounds when loaded.

The principal dimensions are as follows:

| | Feet. | Inches. |
|---|---|---|
| Total length | 2,180 | |
| Height above surface of water | 320 | 10¾ |
| Length of longest bent | 241 | 0¾ |
| With of towers, center to center of bents | 35 | |
| Longest span | 185 | |
| Width over all | 16 | |
| Width, center to center of trusses | 10 | |
| Gauge of railway | 4 | 8½ |
| Weight of iron work | 1,820 tons. | |
| Batter of posts | 1 in 6 | |

In erecting the iron work a traveler was employed which had an arm 124 feet 6 inches long, with a wheel base of 57 feet, and composed of two main trusses 10 feet apart, which carried the weight of the overhanging part and rested directly over the girders of the viaduct, and two secondary trusses, 18 feet apart, built in the support. The structure was built of pine, except the iron tension members and pin plates, and a 4 foot space between the inside and outside trusses was filled with 50,000 pounds of rails, an addition to the counterbalance being made by clamping to the top chord of the supporting girders.

After completing the eastern half of the suspended span the traveler was taken apart and carried a distance of 37 miles by rail to reach the place where it was to be set up at the western end of the structure. On its working deck were two boilers supplying steam to two engines, each having four spools working independently, and on the lower chord of the arm ran a car supporting an A-crab, by which all iron was raised and carried out to a point over its intended position in the structure. Some of the pieces weighed more than ten tons each. In erecting the pairs of cantilevers the portions over the towers were first erected, the shore cantilevers being then built from the tower toward the shore, when the traveler was moved back over the towers to erect the suspended span. To make the adjustment for connecting the halves of the suspended span a 20 ton hydraulic jack was employed.

The work of erection was begun November 3, 1891, and, although there were some interruptions, the halves of the suspended span were connected February 20, 1892, an average force of 67 men being employed for 87 working days, and the rate of progress being 750 lineal feet per month. The work of erection was in charge of Mr. H. D. McKee, representing the Phœnix Bridge Company, by whom all the details of the structure and methods of building were designed, under the supervision of Mr. A. Bonzano, chief engineer of the company.

### The Diamond in Meteoric Iron of Canon Diablo.

After the author's researches there can be no doubt as to the existence of diamond in meteoric iron. This is the first time that this precious stone has been found in what may be considered its primitive gangue. In all the rocks where it has been hitherto met with, even in the pegmatite of India, we may see that it has been introduced as such during the formation of the rock. Here, on the contrary, the very state of the diamond, which appears as a fine powder disseminated in certain parts of the meteoric iron, seems to indicate that it has taken its origin on the spot, and has been formed during the consolidation or the crystallization of the mass.—*C. Friedel, Comptes Rendus.*

## Correspondence.

### A Phenomenal Well.

*To the Editor of the Scientific American:*

The articles in the SCIENTIFIC AMERICAN of the 7th and 14th of January relative to breathing or barometric wells induces me to describe to your readers through your valuable journal a phenomenal well located here in Beardstown, Ill.

This well was drilled in 1891, the strata pierced being 100 feet of drift as sand and gravel, 200 feet of corniferous limestone, 200 feet of slate and shale, passing into 20 feet of crystallized sandstone, a depth altogether of 520 feet. At this depth water began to rise in the well, and when reaching the surface spouted up to a height of 50 feet. The water is a saline mineral water, strongly impregnated with natural gas. The pressure gauge indicated 60 lb. Sufficient gas was obtained to supply two 60 horse power boilers with fuel. This well flows or spouts for eight days, when it ceases for twenty days, not varying a day from these periodic intermissions since it first began flowing. It invariably begins with the new moon. The quantity of water discharged is 4,000 gallons per hour. The gas is still utilized, "when well flows," in an electric lighting station near by. There has been no perceptible diminution in the quantity of gas or water. The well ceased spouting January 28; it is due and will certainly begin again February 15, after twenty days' rest. Occasionally for a display or exhibition the well is ignited ("without separation of the gas") and a fountain of fire is produced—the fire and water mingling to a height of 50 feet, producing a marvelous sight.

What is remarkable about this well is its periodicity. Can you, Mr. Editor, or any of your readers, enlighten me as to the cause? DR. H. EHRHARDT.

Beardstown, Ill.

### Recent Decisions Relating to Patents.

PATENTABILITY.

Letters patent No. 290,571, issued December 18, 1883, to S. B. Goddard, for an improvement in the method of reducing corn in the stalk and separating the kernels, consisting of a cutter with feed rollers in front, a beater or thrasher, a revolving screen or separator, and a shaking screen under it, all mounted in one frame, and so geared that the parts are driven by a single band wheel, are void, since it consists of old and well known devices, not so combined as to form a single machine. 1.

The forty-third claim of patent No. 380,346, issued April 3, 1888, to Willis J. Perkins, for an improvement on a shingle sawing machine, consisting of the combination with a saw carriage of a wooden block furnishing a bearing for the same, and an oil-retaining trough in which the block is seated, is not void for want of patentable invention, the blocks formerly in use being of iron. 2.

The fourth and fifth claims of letters patent No. 401,871, issued April 23, 1889, to Edwin O. Abbott, for a device for cutting figures or letters in bank checks, which claims are for the combination of a stationary feed roll, a rotatable shaft, fixed at one end and movable at the other, and a lever to move the shaft, are void for want of invention, since the only difference between that and prior machines is that the lower roller, instead of the upper one, is made movable. 3.

NOVELTY.

Letters patent No. 231,147, issued August 17, 1880, to C. P. Buckingham, for an improvement in plow beams, consisting of "the combination of an upper and a lower flange, an upper and a lower fillet, and a concavity between the fillets on each side of the plow beam," are void for want of novelty. 4.

Letters patent No. 211,052, for a dumping wagon, are to be construed as for a dumping wagon wherein the body is raised front and rear simultaneously, by folding arms connected with the body and running gear, and suitable connections between the forward ends of the arms and wagon body, whereby, as the latter is raised, it moves rearwardly also with a single power device operating upon one or more of its arms, whereby a single continuous operation will elevate both ends of the body, and move it rearward, and embrace patentable novelty. 5.

The first and third claims of letters patent No. 380,346, issued April 3, 1888, to Willis J. Perkins for improvements in shingle sawing machines, which claims are for the combination of a shingle sawing machine with a lever fulcrumed near the central shaft, so that shaft and carriage may be lifted so as to permit access to the saws, and having a catch piece to lock the lever in position, are void for want of novelty. 6.

INFRINGEMENT—WHAT CONSTITUTES.

Claim 2, which covers a combination of "a reflector constructed with an opening behind the burner, and an auxiliary reflector, whereby the light emitted backwardly through such opening is directed toward the signal plates or lenses," must be limited to a combination of the reflector of the first claim, with its improved opening and an auxiliary reflector, and is not infringed by a reflector with any opening behind the burner and an auxiliary reflector. 7.

A bill which sets forth a patent for a "process" of making furniture nails, and then alleges that defendant, "in infringement of the aforesaid letters patent," did wrongfully "make, use and vend to others, to be used, furniture nails embracing the improvement set forth and claimed" in said patent, is demurrable for want of a sufficient allegation of infringement of the process. 8.

In a suit for infringement of a patent the usual decree for a perpetual injunction and accounting was passed after a full hearing on the merits. More than two months thereafter defendant petitioned for a rehearing and dissolution of the injunction, which was afterward denied. Pending this petition the circuit court of appeals was created. *Held* that, assuming the decree for injunction and accounting to be an interlocutory decree, from which an appeal would lie to that court within thirty days under section 7 of the act creating it (act March 3, 1891; Supp. Rev. St. 901), yet the order denying the rehearing was not appealable, for it was not an interlocutory decree or order continuing an injunction, within the meaning of that section, and it is immaterial that there was no right of appeal at the time the injunction was granted. 9.

OFFENSES AGAINST PATENT LAWS.

The patentee of wooden dishes which might have been marked "Patented," etc., as required by section 4,900, Rev. St., did not stamp the dishes, but only the crates in which they were packed. Upon a suit for penalties under the second paragraph of section 4,901 against the defendant for placing a similar stamp upon crates of similar dishes made by the defendant without license, *held*, on demurrer to complaint, that sections 4,900 and 4,901 must be construed together; that the stamping of articles capable of stamping was necessary; and that the stamping of the crate containing them was insufficient, and was not protected by sections 4,900 and 4,901; and that a similar stamping of his own crates by the defendant did not render him liable to any penalty. 10.

1. Appleton Mfg Co. *v.* Starr Mfg. Co., 51 Federal Reporter, 284.
2. Perkins *v.* Interior Lumber Co., 51 Federal Reporter, 286.
3. Abbott Machine Co. *v.* Bonn, 51 Federal Reporter, 223.
4. Buckingham *v.* Springfield Iron Co., 51 Federal Reporter, 236.
5. Rodenhausen *v.* Keystone Wagon Co., 51 Federal Reporter, 220.
6. Perkins *v.* Interior Lumber Co., 51 Federal Reporter, 286.
7. Steam Gauge and Lantern Co. *v.* Williams, 50 Federal Reporter, 931.
8. Am. Solid Leather Button Co. *v.* Empire State Nail Co., 50 Federal Reporter, 929.
9. Boston & A. Ry. Co. *v.* Pullman's Palace Car Co., 51 Federal Reporter, 305.
10. Smith *v.* Walton, 51 Federal Reporter, 17.

### The Atlantic Sea Bed.

Proceeding westward from the Irish coast the ocean bed deepens very gradually; in fact for the first 230 miles the gradient is but 6 feet to the mile. In the next 20 miles, however, the fall is over 9,000 feet, and so precipitous is the sudden descent that in many places depths of 1,200 to 1,600 fathoms are encountered in very close proximity to the 100 fathom line. With the depth of 1,800 to 2,000 fathoms the sea bed in this part of the Atlantic becomes a slightly undulating plain, whose gradients are so light that they show but little alteration of depth for 1,200 miles. The extraordinary flatness of these submarine prairies renders the familiar simile of the basin rather inappropriate. The hollow of the Atlantic is not strictly a basin, whose depth increases regularly toward the center; it is rather a saucer or dish-like one, so even is the contour of its bed.

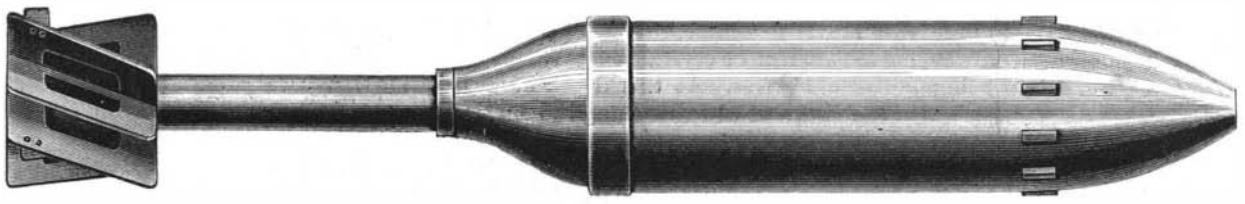
The greatest depth in the Atlantic has been found some 100 miles to the northward of the island of St. Thomas, where soundings of 3,875 fathoms were obtained. The seas round Great Britain can hardly be regarded as forming part of the Atlantic hollow. They are rather a part of the platform banks of the European continent which the ocean has overflowed. An elevation of the sea bed 100 fathoms would suffice to lay bare the greatest part of the North Sea and join England to Denmark, Holland, Belgium, and France. A deep channel of water would run down the west coast of Norway, and with this the majority of the fiords would be connected. A great part of the Bay of Biscay would disappear; but Spain and Portugal are but little removed from the Atlantic depression. The 100 fathom line approaches very near the west coast, and soundings of 1,000 fathoms can be made within 20 miles of Cape St. Vincent, and much greater depths have been sounded at distances but little greater than this from the western shores of the Iberian Peninsula.—*Nautical Magazine.*

### TRIAL OF THE PNEUMATIC CRUISER VESUVIUS.

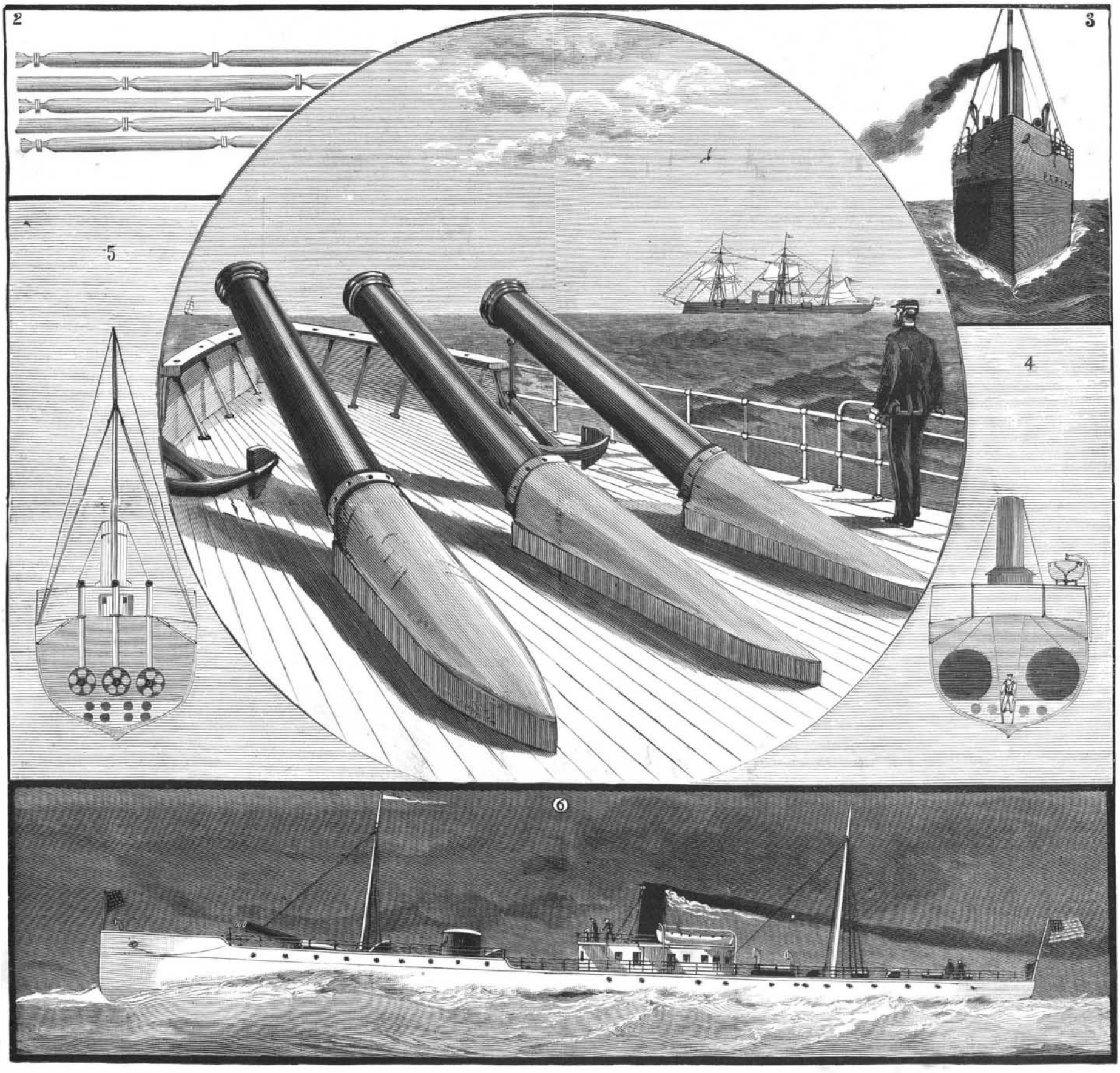
The pneumatic dynamite cruiser Vesuvius has been awarded a second and more exhaustive trial to determine her efficiency in projecting aerial torpedoes by compressed air. The torpedoes are discharged from the so-called Zalinski gun. These weapons represent the ideas of some years ago. In practice from a stationary land platform they have shown the highest degree of efficiency. The destruction of the schooner Silliman, described and illustrated in our issue of October 1, 1887, showed the terrible powers of the weapon as a torpedo thrower.

The Vesuvius was built at Cramps' ship yards and was launched April 28, 1888. The object in building her was to secure high speed and powers of maneuvering. In action she is to run up quickly within a mile of the enemy, discharge her torpedoes, annihilating the target in as few shots as possible, and then to retreat. Her fighting is done under peculiar circumstances. She must be bow on to her target. Thus she offers a small mark. She can do no broadside fighting whatever.

The first trial of the ship as a torpedo thrower took place nearly a year ago, and did not impress our naval authorities favorably. The present trials are designed to determine definitely the value of the guns and torpedoes, and the accuracy which will be attained with them in stationary practice and when the cruiser itself is moving. If the vessel proves a failure in her proper capacity she will be transformed into a dispatch boat, torpedo boat, or other type. The general plan of the cruiser provides a very fast ship with three guns arranged at an elevation. The guns are for most of their length inclosed within the hull; but their muzzles project, side by side, from the forward deck, as shown in one of our engravings. The ship is of 725 tons displacement, 252 feet long and 26½ feet wide. She draws 9 feet of water and is practically unarmored. Some protection is given by her coal bunkers and deflective deck. Her engines, of 4,000 horse power, are designed to drive her at the speed of at least 20 knots. There is no question that in view of recent achievements this speed is too low. One shell entering her hull would probably annihilate her by exploding the tons of guncotton in her torpedoes. The guns are set at an angle of elevation of 18°; they are 15 inches in diameter, 54 feet long, and are made of thin cast iron. Under each gun, and toward its breech, is placed what is known as the revolver. This is a cylindrical structure, resembling an enlarged revolving cartridge chamber of a pistol, and arranged to carry five projectiles. To load the gun, the rearmost section of the gun, which is pivoted at the back, is dropped to a horizontal position, in line with one of the chambers of the revolver. See Fig. 2. The shell is introduced and the forward end of the gun section is again drawn up in line with the rest of the barrel by means of a vertical pneumatic ram. Our cuts show the general disposition of all of these parts. It will be seen that when the revolving cartridge chamber is charged with five shells, after one has been loaded and discharged, a simple turn of the chamber brings another shell into loading position, so that the five can be rapidly introduced and fired.



THE RAPIEFF PROJECTILE FOR PNEUMATIC GUNS.




1. The central cut shows the bow of vessel and the mouths of the pneumatic guns. 2. The storage air cylinders. 3. Bow view of the vessel. 4. Cross section, showing position of boilers. 5. Section showing the pneumatic guns. 6. The Vesuvius running at full speed.

### THE UNITED STATES TORPEDO CRUISER VESUVIUS.

The ship is steered by steam and has twin propellers. Thus she has high maneuvering ability, and it will be seen that this is very essential. It is to be regretted that water jets at bow and stern have not been applied to increase her turning powers. The range of the projectiles, as the guns have a fixed elevation in still water, is determined entirely by the amount of air admitted