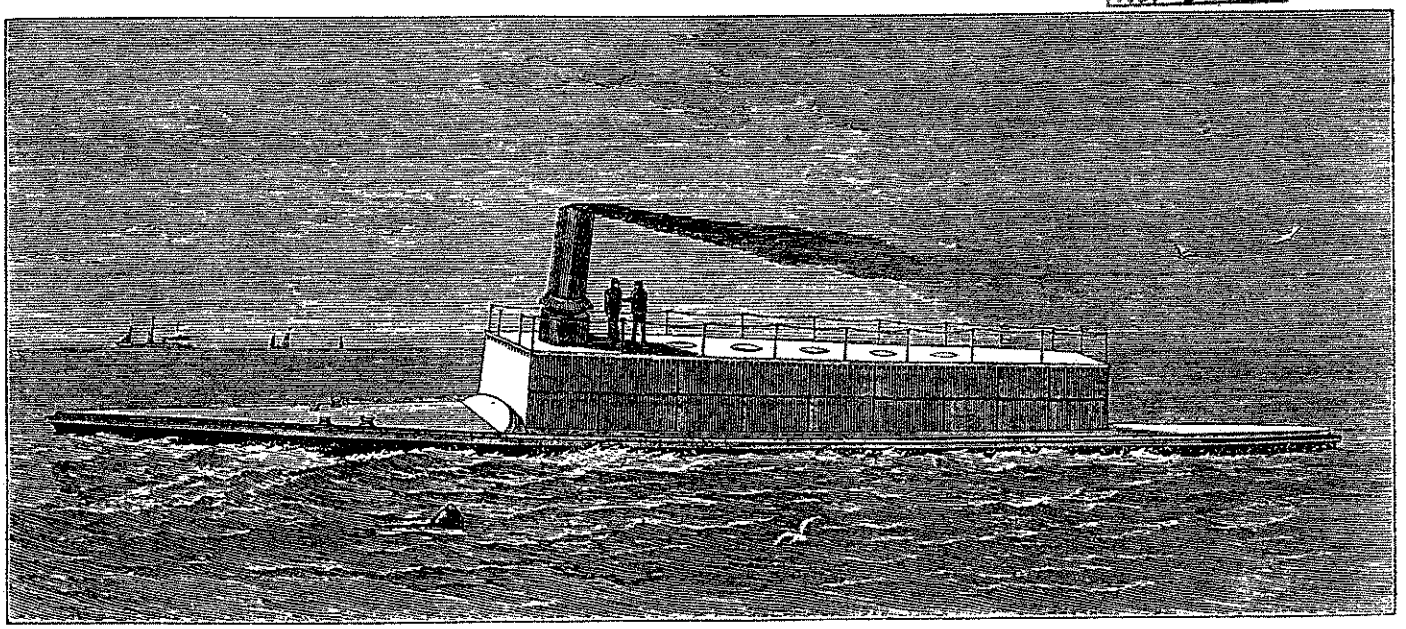
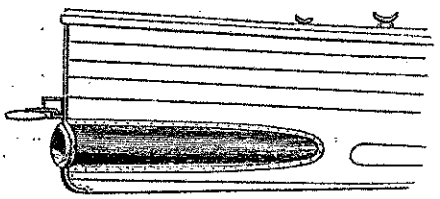
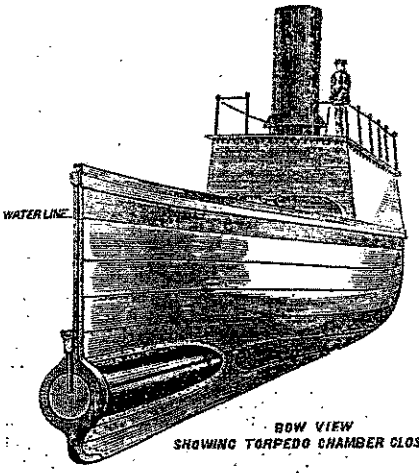
THE DESTROYER—TORPEDO BOAT.

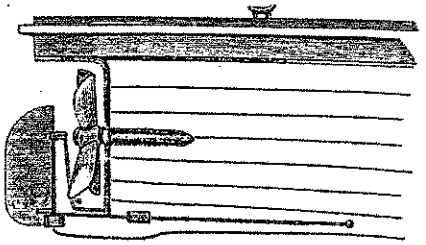




TORPEDO CHAMBER OPEN.



BOW VIEW SHOWING TORPEDO CHAMBER CLOSED



METHOD OF PROTECTING STEERING GEAR

the new system of submarine attack inaugurated by the torpedo vessel described in THE ENGINEER, 30th August, 1878.

Regarding the construction of the hull of the Destroyer, the assumption that the published description is incomplete, will be found groundless on carefully studying the explanation given, viz., that the upper and lower parts of the hull are divided by an intermediate watertight, strongly ribbed plate-iron deck running from end to end of the structure; the lower division—ventilated by powerful blowers—containing the machinery and affording a safe retreat for the crew during attack, while the upper division is filled with blocks of cork, excepting a small part near the bow occupied by wood-backing, and an inclined transverse armour-plate resting on the intermediate deck.

With reference to certain ingenious arguments intended to prove that the Destroyer, in consequence of its extremely fine lines, will turn very slowly, and thus be dangerously exposed should the attack fail, it will suffice to state that the discharge of the torpedo and reversing the action of the propeller will be simultaneous. Hence a retreat of the vessel in the opposite direction to that of the advance will commence before the submarine missile has reached the ship attacked. Obviously the recoil attending the discharge of a body weighing 1400 lb., impelled by the great force before mentioned, and moving through a distance of 30ft. before entering the water, will greatly assist in imparting a retrograde motion to the vessel. Finally, it should be observed that, owing to its peculiar construction, the speed of the Destroyer will be very nearly as great during backing as when going ahead.

New York, October 25th, 1878.

THE TORPEDO VESSEL, DESTROYER.

WE illustrate above the torpedo vessel referred to by Captain Ericsson. We have already described the boat pretty fully. It will suffice to say now that the Destroyer is 130ft. long, 11ft. deep, 12ft. beam, extreme; with both ends precisely alike, and terminating with very fine wedges, probably sharper than any vessel yet built. The peculiarities of the steering gear are shown in the cut. The top of the rudder is 4ft. under water. It is intended that the vessel during attack should be submerged as deeply as the monitors. As the plate iron deck house or cabin, 70ft. long, is rivetted water-tight to the hull, and has no opening in the sides, the vessel can be run with her upper deck below water.

CHICHESTER WATERWORKS.

THE prominent position now taken among engineering questions by those of water supply, especially to small places, will make the following illustrated description of Chichester Waterworks of considerable interest to our readers. The conditions of site are somewhat unusual, but the works contain several features of engineering interest, and are such as are suitable for a large number of towns. The city of Chichester is indebted for this supply to the Rev. Professor Swainson, who was the prime mover in the formation of the company, which in 1873 obtained an Act of Parliament, authorising the construction of the works. These have since been satisfactorily completed, and now provide an ample supply of excellent water. The source of supply is a well sunk in the chalk, adjacent to a powerful spring one and a-quarter miles west of the city. The exact position of the well was determined by the certainty of an adequate supply being obtainable near the spring, while its location so far from Chichester was fixed with a view to avoid the contaminated water enclosed in the geological basin over which the city stands. This basin consists of a thin bed of gravel, contained in the clay of the "Reading Beds," and previously served for each house the usual double purpose of a receptacle of sewage and a source of water supply.

The company's well is sunk clear of this basin on the southern edge of the area of clay which extends from near Worthing to Portsmouth, and which is 1½ miles wide at the point in question. From the north edge of the clay to the summit of the South Downs is chalk, generally with flints, for a width of seven miles, which serves as a gathering ground and natural storage reservoir. The water in the chalk, being kept down by the clay, rises again on its southern edge in powerful springs, so that the well had only to be sunk through the clay to secure a copious supply. This was effected at 47ft. from the surface. The chalk was reached at 26ft., and after it had been penetrated 21ft., the water could no longer be kept down by two 12in. pumps, and the sinking was stopped. It then rose to the surface, and overflowed, and has since continued to do so, except when the pumps are at work. An analysis showed that the quality was of the character usually found in chalk waters of the first class, and the hardness was 15 deg. on Clarke's scale before boiling, and 4 deg. after boiling.

The works consist of a pumping station—partly illustrated in our last impression—at the source of supply, a main pipe, 2½ miles long, passing through the city to a service reservoir and tower, and four miles of distribution pipes. They were designed to supply eventually a population of 10,000 persons with 20 gallons per head per day. At the pumping station the sinking of the well was commenced with wooden cylinders 6ft. diameter inside the kerbs, for a depth of 17ft., after which it was continued with wrought iron cylinders 5ft. 8in. inside diameter. The cylinders were 9ft. long, connected by angle-irons 3in. by 3in. The plates were ⅞in. thick, and the rivets were countersunk on the outer side. The wooden cylinders were lined with brickwork in cement, and the junction between the brickwork and iron was securely caulked with oak wedges. A foundation for the superstructure of the engine-house and the engines was secured by a dome of cement concrete, as seen on page 318 of our last impression.

The engines—see page 336—and pumps are in duplicate, but by different makers. They were each designed to raise on trial 10,000 gallons per hour against a head of 200ft. with a consumption of 3½ lb. of Welsh coal per horse-power estimated by the water lifted, and in actual work they each lift 11,500 gallons per hour against a head of 160ft. with a consumption of 4 lb. per horse-power, water lifted. The first of these engines and pumps were made by Messrs. Hathorn, Davis, and Davey, of Leeds. The engine is horizontal, and of the usual compound type, with the high-pressure cylinder towards the crank and in front of the low-pressure cylinder. The diameter of the high-pressure cylinder is 9½in., and that of the low-pressure is 18in., and the stroke is 2ft. The exhaust steam passes into a common injection condenser, supplied with cold water from an adjoining pond or from the air vessel on the main. The crank shaft is carried between two bearings, both fixed to a cast iron bed plate. On the end of the crank shaft is placed a disc, from which the pump is driven direct from the main shaft. The pump is of the plunger and bucket type, the diameter of the plunger is 8in., that of the bucket 11in., and the stroke 1ft. 6in. Steam is supplied from two Cornish boilers of 4ft. diameter and 14ft. in length, with one flue in each of 2ft. 2½in. diameter. The speed of the engines was designed to be thirty strokes per minute, and in actual work they run from twenty-eight to thirty-five strokes per minute.

The second engine and pump were made by Messrs. Appleby Brothers, of London, who also supplied the duplicate Cornish boilers. The duplicates were provided before they were actually required by the demand for water, in accordance with the principle on which the works were designed, viz., to rely rather on machinery than on storage.

The main pipe, which is 8in. in diameter, rises 40ft. in its course due east along the public road to Chichester Cross, where it turns sharp to the north, and rises a further 60ft. to the service reservoir. This main is used for purposes of economy as a service main and distribution pipe, in its passage through the city, a circumstance which is attended with the disadvantage that it occasions great variations in the pressure causing such small engines to run away when there is a sudden draught of water at a street hydrant. To obviate this a weighted valve is fixed on the main at the engine house, which on any diminution of pressure at once throttles the flow of water. It is, however, proposed to check the engines more promptly by employing a slide valve on the steam pipe which is to be kept open by the pressure of the column of water, and to be instantly closed by a spring when the pressure is relaxed. This valve is being constructed, and may be the subject of a future notice if it answers the expectations formed of it, for there are often cases occurring where such a contrivance will save the cost of an independent rising main to the service reservoir, which is a matter of great importance where the distance is considerable. There are other advantages derivable from the use of the rising main as a service main, for in the first place the size of the service main can be thereby reduced by the amount due to the circumstance that during the period of maximum demand the flow of water is towards the demand from both ends, the pumping station and the reservoir; and besides, where, as in the case of Chichester, the available head of water due to the reservoir is low, a greater head than the reservoir can give can be maintained during the working of the pumps which usually coincides with the period of maximum demand. With such an arrangement also the size of the reservoir can be reduced to what is sufficient for the surplus supply during pumping hours, and for the storage capacity required to maintain the flow during the hours of rest which, being chiefly at night and on Sundays, correspond with the minimum demand. For these reasons the main pipe at Chichester was made 8in. in diameter, and the reservoir was designed to hold 100,000 gallons only,