yards, thence to the extent of the district the gullies can be open to admit air to fill the partial vacuum formed by exhaustion. This plan if carried generally into use would have the effect of producing a down-draught through the street gratings and thus, during the day time, prevent the gases from rising into the streets.

We consider, however, that great precautions would have to be taken, when the furnaces were in use, to shut off the foul air, or to ensure its being carried up the chimney shaft.

An excellent plan for ventilating drains, and very similar to the one proposed by Dr. Godfrey, has been brought forward by Alderman McLaren, an illustration of which will appear in the *Canadian Illustrated News* of the 19th inst., but as the subject is to be discussed soon by the City Council, we shall postpone our remarks on this plan for a future number

In a future number we shall furnish illustrations on the most approved methods of ventilation and drainage of cities.

SOCIETY OF ENGINEERS.

November, 1st, 1875.

MR. W. H. ADAMS, President, in the Chair.

(See page 80.)

Mr. Griffiths has latterly advanced certain views respecting the mode of fitting screw propellers. He advocates, first, the inclosing of the screw within a tube-like case or shield, to which the water coming to the screw can only obtain access from below; the diagram No. 1 shows the arrangement. The author will not enlarge on the scheme, it is one which has provoked much controversy. Mr. Griffiths claims as regards the inclosure of the screw, that the water is more equally fed to the screw, more closely confined to it, and is led from it in such a direction as is best calculated to economise the engine power and give the best working results. He also claims that the inclosing of the screw protects it from fouling and from danger of fracture. Mr. Griffiths likewise advocates the duplication of screws, not on the ordinary twin principle, but in the manner shown in diagram No. 2, one screw being placed in the head and another at the stern of the vessel.

In a paper which Mr. Griffiths read before the Institution of Naval Architects he stated that his attention was first drawn to the necessity of having bow and stern screws from the danger attending the use of the long steamers now employed, that danger being increased by making the safety of the ship dependent on a single set of machinery, an arrangement also that increases the difficulty of constructing machinery, owing to the immense castings and forgings necessary to develope the great engine power demanded to secure high speed. The opponents of the shield-tube over that while the screw has less chance of becoming fouled, should it become fouled it would be infinitely more difficult to clear than an uncovered screw. As regards the use of the tunnel as a water feeder to the screw, Mr. Griffiths cites the case of the Dwarf, which, with a speed at first of about 9 knots, was subsequently reduced to about 3¼ by planking up the after run of the vessel; this result he attributes solely to the circumstance that the alteration of lines obstructed the flow of water to the screw.

In a second paper, Mr. Griffiths stated that, in the course of experiments with a model, he found that when he divided the power and applied one-half to the stern and another to the bow screw, each screw being enclosed within a tunnel, the speed of the model was increased nearly as the square root of the power, but when the power was doubled alone on the bow or stern screw, then the increase of speed was only as the cube root of the power. The way Mr. Griffiths accounts for this is that a better water supply reaches the screw.

Having said so much of a particular and important innovation in existing practice in screw propulsion, the author will now proceed to say a little about the nature of that practice, as carried out by the best firms in the present day. The diagrams illustrate a somewhat singular diversity of practice amongst engineers, the various screws varying greatly from each other, both in the shape and proportion of their blades and the number of blades forming each.

Diagrams No. 3 illustrates a three-bladed screw, fitted to H. M. S. Lapwing by Messrs. Rennie. The diameter of this screw is 8 ft. 6 in., the pitch varying from 9 ft. 6 in. to 13 ft. 6 in. This screw is a fair example of a Griffiths three-bladed propeller, and was designed to comply with those conditions discovered by Mr. Griffiths as regulating the most efficient action of his propeller. It has a boss, which tapers outwards, and the blades are slightly curved forward, the pitch of the screw is uniform. The nominal horse-power of the Lapwing's engines was 80, the indicated power 502, or 6·25 times the nominal; the diameter of the propeller was 3¼ times of the boss.

Diagram No. 4 illustrates a double two-bladed Mangin screw, fitted to H. M. S. Bullfinch. It is 7 ft. 3 in. in diameter, pitch uniform, nominal horse-power of engines, 80; indicated horse-power, 458·5; or about 5⅝ the nominal. This form of screw is frequently made with a varying pitch, and is also made as shown in diagram No. 5, which is a more modern form than that of the screw of the Bullfinch. In February, 1868, H.M.S. Blanche was officially tried, being fitted with a Mangin screw; diameter, 14 ft. 7 in.; pitch of the leading portion of the blade, 15 ft. 7 in., and of the trailing portion 17 ft.; the mean length of blade on keel line being 12 ft. The speed of the ship was 13·631 knots an hour the screw making 88½ revolutions with full boiler power; half boiler power gave 11·78 knots. The official report stated that the use of full power created a heavy thumping acting upon the ship's stern, the same action being very marked during comparative trials with the Shannon about ten years ago,

Diagram No. 6, illustrates a common two bladed screw by Messrs. James Watt and Co., 16 ft. in diameter, and 20 ft. pitch; length of blade on keel line, 3 ft. 4 in.; indicated horse-power of engines 458. A propeller of this kind, provided with lifting gear, was fitted to H.M. troopship Simoon.

Diagram No. 7 illustrates a two-bladed Griffiths propeller fitted to H.M.S. Collingwood by Messrs. Rennie. The author is not in possession of any particulars of its performance.

Diagram No. 8 represents a six bladed screw having a diameter of 15 ft. 9 in., and a pitch varying from 17 ft. 6 in. to 21 ft. 6 in., fitted to the Egyptian Government steamer Charkieh, and the theory of its action was, that by sub-dividing the surface of the blades into many parts, a greater uniformity of action results; but comparative experiments with this and a three-bladed screw demonstrates that little advantage rested with either. The first-named screw was used from Malta to Alexandria; the latter screw was used from Venice to Alexandria, and the hourly consumption of coal was 34 cwt. 0 qr. 9 lb.; mean speed, 10·69 knots.

Trials of the Charkieh with a six bladed propeller and a three-bladed propeller:—

Kind of screw.	Consumption of coal per hour.	Mean speed.
6 bladed	33 cwt. 3 qr. 15 lb.	10·65 knots.
3 bladed	34 cwt. 0 qr. 9 lb.	10·69 knots.

The six-bladed propeller, however, caused the least vibration.

The following table shows the comparative particulars of this vessel with a six-bladed propeller and those of the steamship Ruahine:—

Charkieh and Ruahine.

Name of ship.	Displacement in tons.	Area of midship section in square feet.	Indicated horse-power.	I. H. P. / Area of midship section.	Displacement in. / I. H. P.	Speed in knots per hour.	Area of mid-section in square feet. / Total area of propelling surface in square feet.	Speed 3 — mid-section. / I. H. P.	Speed 3 — 3 — displacement. / I. H. P.
Charkieh .	2200	462	1475	3·192	1 491	11 4	8·105	459·30	169·19
Ruahine . .	1850	424	1540	3 632	1·2	13	10·408	604·88	215·4

Diagram 10 illustrates the propeller of the latter vessel. Diagram No. 9 represents the two-bladed Griffits screw fitted by Messrs. Maudslay to H.M.S. Lord Warden and Lord Clyde, which are sister ships. The diameter of the screws is 23 ft.; mean pitch, 23 ft. 6 in., varying from 21 ft. to 26 ft.; the indicated horse-power of the engines is 6705; number of screw revolutions, 63·3; speed of ship, 13·49; displacement, 9000 tons.