June 15, 1841.

The PRESIDENT in the Chair.

The following were balloted for and elected:—Daniel Pinkney Hewett and John Boustead as Graduates; and Gerrit Simons (of the Hague) as an Associate.

“Description of the new Sewer in the Valley of the Cowgate, Edinburgh.” By George Smith.

In this communication the author first gives an account of a complete system of drainage, designed by him as architect to the Commissioners for improving the City of Edinburgh, and then describes the mode of constructing the first sewer, which begins at the south back of the Canongate, passes along the Cowgate, and through the Grass-market to the foot of the Bow. Sewers in Edinburgh

This principal sewer is 950 feet long; it was built in several sections; the upper portion was 4 feet high by 2 feet 6 inches wide, and increased at the lower extremity to 5 feet high by 3 feet wide; it was constructed of stone with vertical sides, and large flat stones for both the sills and the covers—the dimensions of the branch drains varied in proportion to the quantity of matter passing through them; they were situated opposite the cross streets, and had a cesspool to each, with a malleable iron grating hinged to afford access for cleansing them.

The average depth of the excavations was 9 feet; a great portion of the work demanded great precaution in executing, on account of the narrowness of the streets, the frequent floods, the local impediments from the gas pipes, &c., and the soft character of the ground, as in some places the foundation stones sunk deep into the mossy soil by their own weight; it has, however, proved very successful, and will doubtless induce an extension of the sewage of the City of Edinburgh, which has been too long neglected.

The paper was accompanied by two drawings of the construction of the sewers, and the plan of the general system proposed, with the report to the Commissioners and other explanatory documents.

“On an uniform system of Screw Threads.” By Joseph Whitworth, Assoc. Inst. C. E.

The subject considered in this paper, is the importance of having a constant thread for a given diameter in all screws used in fitting up Uniform screw threads.

steam engines and other machinery. It is argued, that uniformity of thread would be productive of economy, both in the use of screwing apparatus, and in the consumption of bolts and nuts. The refitting shop of a railway or steam packet company affords a striking instance of the advantage to be derived from the application of this principle. If the same system of screw threads were common to the different engines, a single set of screwing tackle would suffice for any repairs.

A common standard. No attempt appears to have been hitherto made to attain this important object. Engineers have adopted their threads without reference to a common standard. Any such standard must be in a great measure arbitrary, and hence its absence may be accounted for.

Choice of thread. The author enters at some length into the consideration of the circumstances affecting the choice of a thread, with a view to show that it cannot be determined by precise rules. **Characters and conditions.** The essential characters of the screw thread are—pitch, depth, and form. The required conditions are—power, strength, and durability. But the exact degree or proportion in which these conditions are required, cannot be ascertained, and consequently the characters on which they depend cannot be fixed by calculation. An approximation may be made, but within a certain limit the decision is arbitrary.

The mutual dependance of the several conditions, and the relation subsisting between the constituent characters, are noticed as having a tendency to perplex in the choice of a thread.

Want of uniformity. From the vagueness of the principles involved in the subject, a corresponding latitude was naturally to be expected in the practical application of them, and accordingly, instead of that uniformity which is so desirable, there prevails a diversity so great as almost to discourage any hope of its removal. The only mode in which this could be effected, would be by a compromise; all parties consenting to adopt a medium for the sake of common advantage. The average pitch and depth of the various threads used by the leading engineers, would thus become the common standard, which would not only have the advantage of conciliating general concurrence, but would in all probability approach very nearly to the true standard for practical purposes.

Selection of a standard. The author then proceeds to describe the mode adopted by Messrs. Whitworth and Co., some years since, in selecting their threads upon this principle. An extensive collection was made of screw-bolts from the principal workshops throughout England, and the average thread was carefully observed for different diameters. The $\frac{1}{4}$ inch, $\frac{1}{2}$ inch, and $1\frac{1}{2}$ inch, were particularly selected, and taken as the fixed points of a scale by which the intermediate sizes were regu-

lated, avoiding small fractional parts in the number of threads to the inch. The scale was afterwards extended to 6 inches. The pitches thus obtained for angular threads were the following:—

Diameter in inches	$\frac{1}{8}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1"	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{3}{4}$	$1\frac{7}{8}$	2"
No. of threads to the inch	20	18	16	14	12	11	10	9	8	7	7	6	6	5	5	$4\frac{1}{2}$	$4\frac{1}{2}$

Diameter in inches	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{3}{4}$	3"	$3\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{3}{4}$	4"	$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{3}{4}$	5"	$5\frac{1}{4}$	$5\frac{1}{2}$	$5\frac{3}{4}$	6"
No. of threads to the inch	4	4	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{4}$	$3\frac{1}{4}$	3	3	$2\frac{7}{8}$	$2\frac{7}{8}$	$2\frac{5}{4}$	$2\frac{3}{4}$	$2\frac{5}{8}$	$2\frac{5}{8}$	$2\frac{1}{2}$	$2\frac{1}{2}$

Above the diameter of 1 inch the same pitch is used for two sizes, to avoid small fractional parts. The proportion between the pitch and the diameter varies throughout the entire scale. Pitch of thread.

Thus the pitch of the $\frac{1}{8}$ inch screw is $\frac{1}{3}$ th of the diameter; that of the $\frac{1}{2}$ inch $\frac{1}{6}$ th, of the 1 inch $\frac{1}{8}$ th, of the 4 inches $\frac{1}{12}$ th, and of the 6 inches $\frac{1}{15}$ th.

The depth of the thread in the various specimens is then alluded to. In this respect the variation was greater than in the pitch. The angle made by the sides of the thread being taken as an expression for the depth, the mean of the angle in 1 inch screws was found to be about 55°, which was also nearly the mean in screws of different diameters. Hence it was adopted throughout the scale, and a constant proportion was thus established between the depth and the pitch of the thread. In calculating the former a deduction must be made for the quantity rounded off, amounting to $\frac{1}{3}$ rd of the whole depth, *i. e.* $\frac{1}{6}$ th from the top, and $\frac{1}{6}$ th from the bottom of the thread. Making this deduction, the angle of 55° gives for the actual depth rather more than $\frac{2}{3}$ ^{ths}, and less than $\frac{2}{3}$ rds of the pitch. Depth of thread.

It is observed, that the system of threads thus selected has already been widely extended, demonstrating the practicability and advantage of the proposed plan. The author then notices the obstacles to general uniformity arising from the inconvenience which any change would occasion, in existing establishments, and also from the imperfect screwing tackle in general use. He anticipates as an important result of a combined effort to introduce uniformity, that screwing Calculating the depth.

tackle generally would be much improved, and the efficiency and economy of bolts and nuts be thereby increased.

He recommends also standard gauges of the diameters and threads, as they would form a convenient adjunct to the screwing apparatus, and would be applicable to other useful purposes.

Mr. Field. Mr. Field claimed for the late Mr. Maudslay the credit of the first attempt to introduce uniformity of thread—it was well known how incessantly his attention and skill had been devoted to this object, and with what success his efforts had been attended. He would at the same time accord great merit to Mr. Whitworth, not only for his present effort to introduce a very desirable measure, but also for the general excellency of the screwing tackle made under his directions.

Mr. S. Seaward. Mr. Seaward corroborated all that Mr. Field had advanced: he had always considered that to Mr. Maudslay the mechanical world was indebted for the accuracy with which screws were now made. He considered the plan proposed by Mr. Whitworth to be good, but difficult of attainment in old-established manufactories, where very extensive assortments of screwing tackle already existed.

The President. The President concurred in the opinion, that it was to Mr. Maudslay's well-known talent and skill that the mechanical world was indebted for the great improvements in the form of the screw, and the mode of its manufacture; but it was to Mr. Whitworth that the Institution was indebted for having brought the subject before the meeting: he trusted that this example would not be lost upon the numerous members, who could contribute so largely to the interests of the meetings, by recording the facts which came under their notice in the course of their diurnal employments.

“Account of the original construction and present state of the Plymouth Breakwater.” By William Stuart, M. Inst. C. E.

Plymouth Breakwater. In the year 1806, the Lords Commissioners of the Admiralty instructed the late Mr. John Rennie, C. E., and Mr. Whidby, then Master-Attendant at Woolwich Dock Yard, to make a survey of Plymouth Sound, with a view to the construction of a breakwater for sheltering vessels.