

The calculated calorific value is 14,830 thermal units per pound, which corresponds to the evaporation of 15.35 pounds of water from and at 212° F. A portion of the coal used was also tested by a Thomson calorimeter, and gave a value of 14,980 thermal units per pound. Thirteen samples of furnace gases were taken over mercury and were analyzed. The following are the means :—

	By volume per cent.	By weight per cent.
Carbonic acid	8.20	12.12
Carbonic oxide	0.00	0.00
Oxygen	11.17	12.01
Nitrogen	80.63	75.87
	100.00	100.00

Chimney temperatures were read every half-hour by a mercury thermometer and by two Murrie pyrometers at 30 feet above the furnace bars. The readings of the three instruments agreed, the average temperature being 452° F. It was a pity that the readings were taken so far from the fires, it being desirable to know the heat of the products of combustion immediately after leaving the heating surface of the boiler. The arrangement, however, was unavoidable, owing to the exigencies of running the ship on her voyage. The measurement of the feed was carried out by means of two tanks in the usual way. An effort was made to determine the quantity of water brought over unevaporated, by the draught of steam. This was done by taking samples of condensed steam from the steam pipe and samples of boiler water, and analyzing them to ascertain the percentage of salt. Unfortunately the apparatus broke down; but from two pairs of analyses made, it was estimated that there was 2.87 per cent. of unevaporated boiler water in the condensed steam. If this were the case with boilers so easily driven as those of the *Iona*, where there could hardly have been any semblance of "priming," as the term is understood by engineers, the quantity of water brought over in small and hardly driven boilers must be enormous. It is a point of the greatest importance in steam-engine economy, and we trust Prof. Kennedy will pursue his investigations in this direction. It also came out during the discussion that the stop valve, or throttle valve, was very much closed during the trial, a fact which should still further have reduced the chance of unevaporated water finding its way into the engines.

Indicator diagrams were taken every half-hour during the trial, and an average set is attached to the report. The power was very evenly distributed between the three cylinders, showing good design of the engines. The total indicated horse-power was 645.4. Diagrams were also taken from the air and circulating pumps. For these interesting and valuable details we must refer our readers to the paper itself, as we are unable to reproduce the diagrams.

The following are some of the chief elements of the trial :—

Date	July 13 and 14, 1890.
Duration of trial	16 hours.
Heating surface, total	3160 square feet.
" " tubes	2590 " "
Grate area	42 " "
Total heating surface to grate surface...	75.2 ratio.
Grate area to flue area through tubes...	2.3 " "
Mean boiler pressure above atmosphere	165.0 lbs. per sq. in.
Mean admission pressure, high-pressure cylinder	142.5 " "
Mean vacuum in condenser below atmosphere	13.88 " "
Mean revolutions per minute	61.1
I.H.P. of high-pressure cylinder	205.6
" intermediate "	221.2
" low-pressure "	218.6
Coal burnt per hour	942 pounds.
" " square foot of grate per hour	22.4 " "
Coal burnt per square foot of total heating-surface per hour	0.298 " "
Coal burnt per I.H.P. per hour	1.46 " "
Carbon equivalent of coal	1.02 " "
Feed-water per hour	8616.0 " "
" " lb. of coal	9.15 " "
" " " from and at 212° F.	10.63 " "

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Efficiency of boiler	69.2 per cent.
" engine	17.1 " "
" engine and boiler	11.8 " "
Mean speed of vessel during trial	8.6 knots per hour.

A long discussion, occupying both evenings of the meeting, followed the reading of the paper, but our account has already extended to such a length that we cannot give a report of it. Perhaps the most interesting point raised was in connection with the closing of the chimney damper, which it appeared was only one-sixth open during the trial. The reason given for this was that in this way heat was prevented from escaping up the chimney. It is difficult to account for such an effect, excepting perhaps to some trifling extent due to minor causes, but several engineers whose opinion is worthy of respect testified that such was the effect in practice. One would think that the escape of heat by the chimney would be governed by the volume of escaping products of combustion with a chimney of any reasonable cross area.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The first Clerk Maxwell Scholarship, for research in Experimental Physics, has been awarded to W. Cassie, M.A., Trinity College.

Mr. H. J. Mackinder, the Reader in Geography at Oxford, is to lecture for the Teachers' Training Syndicate on "The Teaching of Geography," on May 30.

The annual dinner of the Philosophical Society was held in the Combination Room of St. John's College on May 2, Prof. G. Darwin in the chair.

DUBLIN.—Sir Robert Ball begins on Wednesday, the 13th inst., a course of lectures on "The Theory of Screws," in Trinity College, Dublin.

SCIENTIFIC SERIALS.

THE *Quarterly Journal of Microscopical Science* for March contains:—On a new species of Phymosoma, with a synopsis of the genus, and some account of its geographical distribution, by Arthur E. Shipley (Plate xi.). The new species, *P. veldoni*, was found by Prof. Weldon at Bimini Island, the Bahamas; it has no trace of hooks on the introvert; there are two retractors. A synopsis of the twenty-seven species now known is given, but seventeen species are described in Selenka's monograph on the Sipunculidæ. As to the geographical distribution, seventeen species are found in the Malay Archipelago, of which thirteen are endemic, five are found in the Red Sea, four in the Mauritius, and three are found in the West Indies, but *P. lovenii* is found only in the Bergen Fiord.—On the British species of *Crisia*, by Sidney F. Harmer (Plate xii.). The author thinks that the ovicells furnish satisfactory specific characters; the aperture in the ovicell is also an important character. Specific diagnoses of *C. denticulata*, Lmk., *C. eburnea*, Linn., *C. aculeata*, Hass., and *C. ramosa*, n. sp., are given. Notes are given of the habit of the Zoarium at different seasons, on the mode of branching, and on the breeding-times.—The later larval development of *Amphioxus*, by Arthur Willey (Plates xiii.–xv.). The author again visited Messina, in the summer of 1890, to complete his studies on the development of the atrial chamber of *Amphioxus*. As a possible explanation of the asymmetry of the larva, Willey thinks that it can be traced ultimately to the adaptive forward extension of the notochord, being thus a purely ontogenetic phenomenon; the club-shaped gland is shown to be a modified gill-slit.—On the structure of two new genera of earthworms belonging to the Eudrilidæ, and some remarks on *Nemertodrilus*, by Frank E. Beddard (Plates xvi.–xx.). *Hyperiodrilus africanus*, n. gen. and sp., and *Heliodrilus lagosensis*, n. gen. and sp., found in a Ward case from Lagos, at Kew Gardens.

The only article of general interest in the *Nuovo Giornale Botanico Italiano* for April is a note on the stigmatic disk of *Vinca major*, by Sig. M. Pitzorno. In the reports of the Italian Botanical Society are short papers by Sig. Baccarini on the secretory system of the Papilionaceæ; on the arrangement of herbaria, by Sig. L. Micheletti; and others of special interest to Italian botanists.