Philosophical Magazine Series 5

ISSN: 1941-5982 (Print) 1941-5990 (Online) Journal homepage: <http://www.tandfonline.com/loi/tphm16>

On the velocity of efflux of liquids

M. Vautier

To cite this article: M. Vautier (1886) On the velocity of efflux of liquids, Philosophical Magazine Series 5, 21:130, 285-286, DOI: [10.1080/14786448608627846](https://doi.org/10.1080/14786448608627846)

To link to this article: <http://dx.doi.org/10.1080/14786448608627846>

Published online: 29 Apr 2009.

Submit your article to this journal [↗](#)

Article views: 2

View related articles [↗](#)

considered by some to be an extension of the zone of *H. planus*, the form which marks the passage from the soft to the hard chalk. In the remainder *M. cor testudinarium* was common (zone of *M. cor testudinarium*).

Seen in thin sections under the microscope, the structure of the hard beds which mark the limits of the Middle Chalk was stated to be very similar.

In conclusion, the author considered that the divisions of the Middle Chalk, as set forth in the Cambr. Memoir, are well shown in the cliffs of Dover; but the hard beds which appeared to him the equivalent of the Chalk Rock, and mark the upper limit of Middle Chalk, attaining a great development at Dover, it became necessary to examine the palæontological position of that bed to which the name "Chalk Rock" was given by Mr. Whitaker. Having studied Mr. Whitaker's description given in the 'Geology of the London Basin,' and having examined exposures of this rock between Cambridge and the Thames, he came to the conclusion that there was probably more than one bed to which the name Chalk Rock might be applied, and that these, probably not all persistent, may occur at different palæontological horizons. He therefore proposed to take the zone of *H. planus* as the top of the Middle Chalk; although this zone was difficult to identify inland, from the paucity of its fossils, the base of the overlying zone was well marked by the abundance of *Micrasters* and other forms, which appeared to him more closely allied to Upper than to Lower Chalk.

He believed that while the Chalk Rock seen at Henley may be considered the summit of the Middle Chalk, the Chalk Rock of Cambridgeshire, though convenient for marking the summit of the Middle Chalk of that county, included that which was really the upper part of the zone of *H. planus* and the base of the true Upper Chalk, the equivalent of chalk with many *Micrasters* of Dover.

He would therefore consider the Middle Chalk of Dover to be that included from the base of the grit-bed to the summit of the zone of *H. planus*. Its thickness was 242 feet at Shakespeare's Cliff. He was indebted to M. Curry, Esq., of Dover, for this accurate measurement.

XL. Intelligence and Miscellaneous Articles.

ON THE VELOCITY OF EFFLUX OF LIQUIDS. BY M. VAUTIER.

THE experiments which lead to the determination of the velocity of efflux generally depend on a measurement of the quantity, and on a coefficient of contraction of the jet. Bossut, however, verified Torricelli's law by two experiments, in which he measures the range of a horizontal jet of water (*Traité élémentaire d'Hydrodynamique*, vol. ii. p. 120).

In the course of researches on this subject, I have applied a graphic method which enables me to measure directly the velocity of efflux of liquids, and I have made use of this method for months.

In the flat horizontal bottom of a cylindrical vessel full of water, is an orifice in a thin plate, for which can be substituted an *ajutage*. Inside the vessel and in the line of its axis is placed a tube containing an emulsion of an insoluble liquid of the same

Phil. Mag. S. 5. Vol. 21. No. 130. March 1886. X

density as water. This liquid is a mixture in suitable proportions of nitrobenzole and oil of turpentine. The very fine bubbles of emulsion pass along the axis of the jet, of which they take the exact velocity, as I have ascertained by modifying the density of the liquid; within pretty wide limits experiment shows a velocity independent of this density. This velocity is occasioned as follows.

The image of the jet, and therefore that of the bubbles, is formed on a photographic plate, which, by means of a suitable mechanism, is made to move at right angles to the trajectory of the jet. When the liquid begins to flow out the plate is exposed, and thus the sensitive plate receives the image of the jet during its passage.

The developed plate shows then one or more lines according as one or more bubbles have passed during the course of the plate. These lines are slanting; the direction of each is made up of two rectangular motions, that of the plate and that of the bubble. The velocity of the plate is determined by the vibrations of a tuning-fork, and the exact direction of the motion of the photographic plate is marked by a dotted line. The angle which one of the slanting lines of the photographic plate makes is measured; from this angle we easily deduce the velocity of the bubble, and hence that portion of the jet which is being investigated.

I have applied this method to the measurement of the velocity of efflux through an orifice in a thin plate 5.90 millim. in diameter under pressures varying from 0.15 metre to 0.30 metre of water. These experiments have been at first intentionally limited to such similar pressures, in order that we could settle by the constancy of the results the real accuracy of the method. With an imperfect apparatus, the mean error has remained below $\frac{1}{150}$.

I intend to investigate in this way, but under considerably different pressures, the efflux of different liquids, and particularly of viscous ones.—*Comptes Rendus*, Jan. 18, 1886.

A METHOD OF PRECISELY MEASURING THE VIBRATORY PERIODS OF TUNING-FORKS. BY PROF. A. M. MAYER.

The third volume of the Memoirs of the National Academy of Sciences contains a paper by Professor A. M. Mayer, embodying the results of a research recently carried on by him with funds from the Bache endowment. This research has as its object the elaboration of a method for measuring accurately the times of vibration of tuning-forks, and the determination of the laws of their vibrations with reference to the use of the tuning-fork as a chronoscope. The method employed was briefly to make a clock flash, at each second, a spark of induced electricity on a trace made by a style attached to the prong of the vibrating fork. To accomplish this the pendulum of the clock was armed with a triangular piece of platinum-foil, which each second cut through a globule of mercury contained in a small iron cup. To ensure the best results fresh mercury was taken with each experiment, and the height of the mercury was adjusted by a screw-collar in such a way as to make the globule as nearly as possible rigid and free from vibrations