

1. In a time of *little* rainfall there is no ebb-and-flow, and the two lower outlets are large enough to take off all the water.

2. In a time of *large* rainfall there is no ebb-and-flow; but the water streams continuously through the iron grating, and sometimes flows over the front wall of the trough.

3. It is only in times of *moderate* rainfall that the ebb-and-flow can be seen.

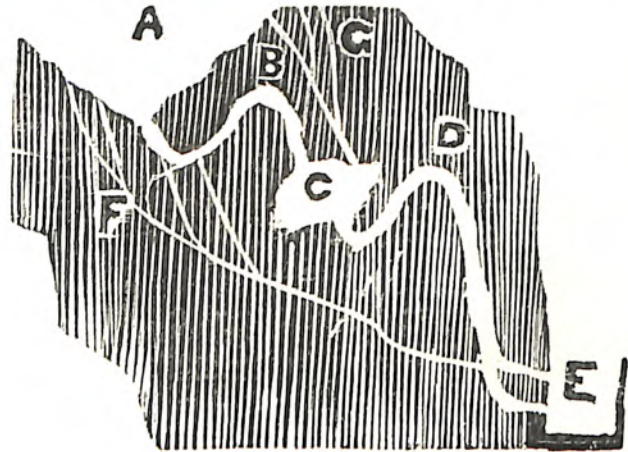
The Eccentricities of the Well. We have given the normal period of the ebb-and-flow at 5.08 minutes, and the normal rise and fall at 8 inches; but there are some most interesting variations upon this. The ebb may have fallen only half the distance to the lower outlets when another flow begins; or the flow may have risen only half the distance to the upper outlets when another ebb begins. Sometimes when the water keeps at the height of the grating a very slight ebb-and-flow may be noticed. We have measured this at 1 and at 1½ inch. Sometimes when the water does not rise above the two lower outlets a similarly slight ebb-and-flow may be seen.

The Siphon Theory. What is the cause of the ebb-and-flow? The only explanation we know of is that in the rock there are water-ways that act on the principle of the siphon; that there is in the rock some natural cistern or reservoir, and between it and the Well some passage or passages that siphon the water from that cistern. The Well *flows* as the cistern is being emptied, and *ebbs* as the cistern is being filled.



Ebbing and Flowing Well.

Mr. Thomas Hargreaves was the author of what we may call the *double-siphon* theory. This may be explained by the help of the accompanying illustration.



A is the basin in the rock; **C** a smaller basin; **B** the channel that conveys the water from **A** to **C**; **D** the channel that conveys the water from **C** to the Well (**E**); **F** crevices through which the water escapes into the channel **D** when the stream is not sufficient to fill the channel **B**; **G** crevices through which the water escapes from **A** to **C** when **A** is overcharged.

It will be seen that **B** and **D** form each a siphon; **B** draws off the water from **A** and fills the smaller basin **C** until it runs over at **D**; now **D** being wider than **B** soon empties the basin **C**, and then the stream ceases until **C** is filled again, thus causing the ebb-and-flow. In dry weather there is no ebb-and-flow, because the water cannot fill the siphon **B**, and after much rain the basin **C** is kept constantly full by **B** and the crevices at **G**.

"The irregularity of the reciprocations, says Mr. Hargreaves, is caused thus:—The channel **B** draws off the water from **A** faster than it is supplied by the spring: consequently **A** becomes empty and no reciprocation takes place until it is filled again to **B**, when the fulness of **A** causes a most powerful one, and before the Well goes down again to its proper medium, another (but less powerful one) takes place; and the interval between the reciprocations increases until the basin **A** is emptied again."

1869

THE GRAMMAR SCHOOL OF KING EDWARD THE SIXTH,
GIGGLESWICK, NEAR SETTLE, YORKSHIRE.

VISITOR—RIGHT REV. THE LORD BISHOP OF RIPON.

BOARD OF GOVERNORS.

Chairman, Sir James Kay Shuttleworth Bart., Gawthorpe Hall, Burnley;
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William Allen Francis Saunders, Esq., Wennington Hall, Lancaster;
Thomas Stackhouse, Esq., Taitlands, Settle, Yorkshire;
Mathew Wilson, Esq., Eshton Hall, Gargrave, Leeds;
Thomas Edward Yorke, Esq., Halton Place, Hellifield, Leeds.

This foundation has been for centuries possessed of estates the income of which has supported a Grammar School for Giggleswick and its vicinity. The value of these estates has considerably increased, and the Governors have in consequence determined to render the School accessible to the inhabitants of neighbouring counties. In accordance with this plan a Hostel has been established to receive boarders which resembles the most convenient Boarding Houses at the best large English Schools; it contains studies for the elder boys, and the dormitories are so arranged that each boy has a separate compartment.

This Hostel, which is designed for forty-nine boys, is under the control and management of the Head Master. He is aided by resident Assistant Masters, so that all boys who need help and attention will prepare their evening work under supervision.

A sanatorium with a trained nurse, in a commodious building separate from the Hostel and isolated, receives all cases of sickness immediately on their occurrence.

There is a field for cricket and football containing 5 acres close to the Hostel.

Day-boys free.

Terms for Boarders in the Hostel £80 per annum, inclusive of tuition, board, lodging, and washing.

HEAD MASTER, THE REV. GEORGE STYLE, M.A., Fellow of Queen's College, Cambridge, and sometime an Assistant Master at Clifton College.

SECOND MASTER, C. H. JEAFFRESON, Esq., M.A., late Scholar of Lincoln College, Oxford, and Assistant Master at Cheltenham College.

A Third Master and a Science Master will be appointed by the Governors as soon as the number of Boarders renders these appointments desirable.

MASTER OF THE PREPARATORY DEPARTMENT, A. BREWIN, Esq., formerly a student of St. Mark's College, Fulham, during the Principalship of the Rev. Derwent Coleridge.

The Head Master is responsible for the discipline and general management of the School; the whole being under his immediate superintendence.

The School is divided into a Preparatory Department and an Upper Department.

In the Preparatory Department younger boys and those who may otherwise need such instruction will receive a careful grounding in all the elements of a sound English education as a preparation for their entrance into the Upper School. The course of instruction will include

English Reading and Recitation,	English History,
Writing,	Geography,
Writing from Dictation,	Arithmetic
English Grammar and Composition,	and the Accidence of Latin.

No boy will be admitted into the Upper School until he can pass a Preliminary Examination, showing his proficiency in reading aloud with correct expression; in writing from dictation; in English Grammar or the Accidence of Latin; in Arithmetic to simple proportion; and in the Geography of the United Kingdom and Europe.

The UPPER SCHOOL will consist of two Departments—the *Classical* and the *Modern*.

The *Classical Department* is intended for the preparation of boys destined to finish their education at the English Universities.

On the other hand the *Modern Department* will be so ordered as to secure as thorough an education as possible for boys intended to enter commercial pursuits at 17 or 18 years of age.

The studies and requirements in these two Departments will be as follows:—

THE CLASSICAL DEPARTMENT.

Before admission every boy must pass an examination in the Accidence of Latin, and in translating an easy Latin prose author. Instruction will be provided in

Latin,	Mathematics,
Greek,	History,
Arithmetic	and English Literature.

The Pupils of this Department will also receive instruction in French or German whenever the Head Master shall conceive such additional work expedient.

THE MODERN DEPARTMENT

will furnish instruction in

Latin,
French,
German,
English Grammar and Composition,
English Literature,

History of England and the British Empire,
Arithmetic
Mathematics, pure and applied,
Physical Geography

and Chemistry (theoretic and practical) or some other branch of Natural Science may be added, whenever the Head Master and the Governors shall be of opinion that the number of boys admits of the appointment of a Science Master. The Head Master with the concurrence of the parent or guardian of any boy may substitute a modern language or English literature for Latin.

When the Hostel is filled with Boarders the Governors intend to establish Scholarships to be held in the School, and Exhibitions to be held in the Universities by any Pupils who may win them in open competition.

Giggleswick is one of the Schools which have the privilege of sending boys to compete for the Lady Hastings' Exhibitions at Oxford.

The Governors will in a short time publish the regulations under which boys will be permitted, in special cases, to board in houses licensed for that purpose.

The Vacations are at Midsummer and Christmas.

A Quarter's notice must be given in writing before the removal of any pupil.

The School is situated in a beautiful and healthy locality; and there is railway communication with all parts of Lancashire and Yorkshire as well as with Westmorland and Cumberland.

All communications about School matters to be addressed to the Head Master, at Giggleswick, Settle, Yorkshire.

3rd July, 1869.



Well, before and after being repaired.

We are convinced that this does not, and cannot explain all the phenomena of the Giggleswick Well. There is not that kind of irregularity of which Mr. Hargreaves speaks; no such variation of period and of volume. There may be a full or a partial ebb-and-flow for a day, or for days together; but not that change from full to partial, and from partial again to full, which Mr. Hargreaves' theory needs. Mr. T. Green, of Settle, visited the well daily during two whole summers, and frequently during the intervening winter; and on many days was there twice or thrice; and he says, "The irregularity spoken of by Mr. Hargreaves does not exist. The ebb-and-flow at one time is longer than at another, but the variation is slight in the course of a day." We are convinced that no one who has made a systematic observation of the Well has seen that gradual increase between flux and re-flux of which Mr. Hargreaves speaks. His theory would certainly give *an* ebbing-and-flowing well; but it would as certainly not give *the* ebbing-and-flowing well that is at the foot of Giggleswick Scar.

Some years ago Mr. T. Green made a model by which he is able to reproduce all the phenomena of the Well, with the one exception of the "silver cord." In this model he has discarded the idea of the double siphon and of the complex system of water-ways that Mr. Hargreaves assumed. Mr. Green has one cistern and one siphon connecting the cistern with the well. The cistern has one feed-pipe, and another pipe carries an independent supply to the well. By means of a tap the supply to the cistern may be diminished or in-