two plane surfaces, each bounded by a single curve, then the question arises: Is it possible to find a conform representation of the one on the other? and, if so, what further conditions can be imposed? Riemann gives the theorem that this is always possible and in one way only, in such a manner that a pair of given points of the one figure, one on the boundary and one in the interior, correspond to similarly given points in the other figure. He considers the case when the one figure is a circle, and proves the theorem:—Any simply connected plane figure T can be conformly represented on a circle in such a manner that a given point on the boundary of T corresponds to a given point on the circumference of the circle, and a given interior point of T to the centre of the circle, and this can be done in one way only.

This special case includes the general one, for if two surfaces, T and S, have both been represented on the circle, then also is a representation of one on the other determined.

These and similar important theorems about the general theory of analytical functions were proved by Riemann by aid of "Dirichlet's principle" (Thomson's theorem) already mentioned. This is proved by aid of the calculus of variation. It maintains that a certain definite integral must have necessarily one, and only one, minimum value; its proof, therefore, depends on the calculus of variation.

Whilst the notion and definition of a function were gradually extended, more has also become known about possible discontinuities; and here, again, the theory of potential has greatly helped. In the latter, discontinuities occur which are due to the essentially discontinuous distribution of matter, and which extend over surfaces and lines. Accordingly, we see that an analytical function of $z$ may have discontinuities which extend over lines. Here it must be borne in mind that we know nothing about the possible discontinuities of functions, excepting what we have learned from known functions. Riemann's theory requires that the discontinuities are given, but does not teach us which are possible. Other speculations have shown that the existence of a derived function is not a consequence of continuity; that a function may be integrable without being differentiable, and so on. In fact, of an analytical function in its generality we know almost nothing, and, above all, we do not know how far the methods of the infinitesimal calculus and of the calculus of variations can safely be applied to an unknown analytical function in all its generality. Hence, if, as in the proof of Dirichlet's principle, these methods are used, the functions are endowed with properties which themselves require to be proved. Thus the validity of that principle becomes doubtful, and with it the whole of Riemann's theory. Objections of this kind, first raised by Kronecker and Weierstrass in their lectures, have since been repeated in more specific terms by various mathematicians, and it has long been generally accepted that Riemann's theorems cannot be considered as proved by him.

O. HENRICI.

(*To be continued.*)

## *HUET'S ANEMOMETER.*

THIS instrument is not a new invention. We claim for it rather the honour of being the first of its kind invented. In the article on "Anemometers" in the "Encyclopædia Britannica" mention is made of the efforts of several scientific men in this direction, but neither in this nor in any other such publication can we find any notice of M. Huet's invention. In the said article these instruments are divided into various classes according to the principle upon which they are based, the class to which M. Huet's anemometer would be assigned being described as instruments which "measure the wind force by the difference of level it is capable of producing in an inverted syphon, or U tube, containing water or some other liquid. Lind's anemometer, invented in 1775, is the best known of this type, and is still in common use." Turning to the Philosophical Transactions of the Royal Society for 1775, we find on p. 353 a "'Description and Use of a Portable Wind Gage by Dr. James Lind, Physician, at Edinburgh.' Redde May 11, 1775." Dr. Lind's description of his instrument may be briefly stated as follows:—"This simple instrument consists of two glass tubes . . . connected together like a siphon by a small bent glass tube. . . . The whole instrument is easily turned round upon the spindle by the wind, so as always to present the mouth of the tube towards it. The force or momentum of the wind may be ascertained by the assistance of this instrument by filling the tubes half full of water . . and observe how much the water is depressed by it in the one leg and how much it is raised in the other."

Now we maintain on behalf of M. Huet's anemometer

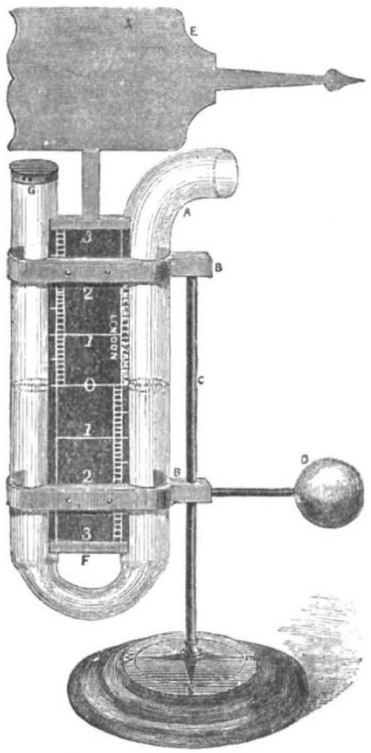


FIG. 1.—Lind's Anemometer.

that it exactly answers this description, and, moreover, that his discovery was given to the world half a century earlier than that of Dr. Lind. It is true that Dr. Lind's description and diagram are much more scientific and business-like than those of M. Huet, nevertheless the principle of the instrument is precisely the same.

Translated, M. Huet's description reads as follows:—

"We have worked with success of late to know exactly the quality of the air, its heat, its humidity and its weight by means of the thermometer, the hygrometer, and the barometer, which is a balance of air. But although we have endeavoured to weigh the air, we have not thought of weighing the wind! I made a suggestion about it to Hubin, an excellent English maker of this kind of instrument. He laughed at it, as of a thing easy to think about, but impossible to execute. I gave him the description of an instrument which I had imagined proper to this effect, and he was so satisfied with it that he left me with the design of making it as soon as possible, but his death frustrated his intention. Here it is in few words.



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"It consists of a funnel of white iron, ABC, like a monk's hood. This funnel bends and becomes narrower up to C, where a tube begins and descends to D, where it bends round in DIE, and reascends to K, where it terminates. We fill the tube with quicksilver from CDE up to F. Above F up to G we pour some lye water, of which the rising and falling is perceived by some little dots which are marked on the tube from F to G. The wind entering by the funnel AB strikes the quicksilver at C, and presses more or less according to its force. The quicksilver pressed goes down in proportion, and going down from this side of the funnel it rises in the other branch of the machine above F, and raises the lye water which it supports; and this elevation is noticed and calculated by the dots marked on the tube.

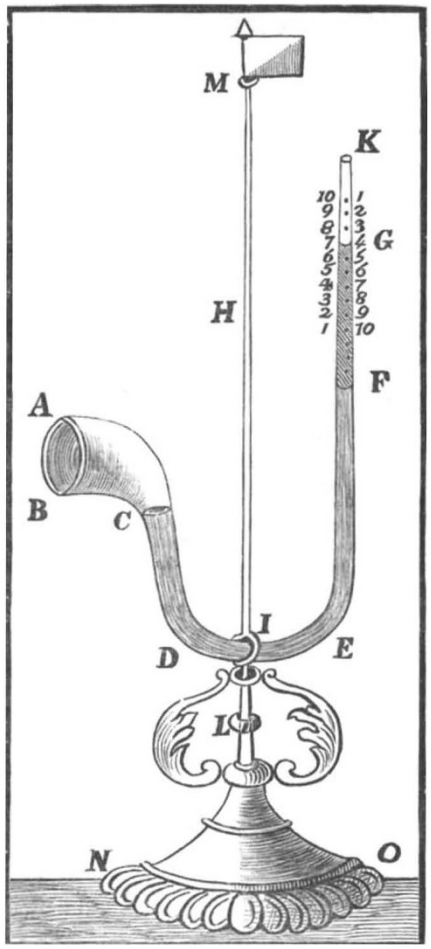


FIG. 2.—Huet's Anemometer.

"And because the instrument may not act if the funnel is not turned towards the wind, it is necessary to adapt a vane M supported by the iron rod MHI. This rod forms a ring at the point I, which encircles and holds firmly the tube. The iron rod below the ring enters a ferrule L, poised on the pedestal LNO, where it turns to the right and left according to the wind which turns the vane, and in turning thus it turns at the same time the whole machine, and holds the funnel always towards the wind."

The instrument, as sketched by the inventor, is extremely toy-like in appearance, and the inevitable result of its first exposure would be its destruction by the very force it was intended to measure. The tube, although encircled by the ring at I, is insufficiently supported, and the vane, M, is not large enough effectually to turn the machine. Lind's anemometer is an improvement on Huet's chiefly in these two particulars—the tubes being brought closely and bound firmly together, and the instrument itself acts as a vane by being set in a spindle. It must, however, be remembered that Huet's invention was never given a trial—in fact, not even made, or these faults would have been easily seen and rectified.

Pierre Daniel Huet, the inventor of this anemometer, was born at Caen on February 8, 1630. He was the author of many works, tutor to the Dauphin (1670), and Bishop of Avranches (1692). He died at Paris on January 26, 1721. The work from which the above description and accompanying sketch are taken is entitled "Huetiana; ou Pensées diverses de M. Huet, Évêque d'Avranches" (Amsterdam, 1723).

W. J. LEWIS.

## *VIRCHOW TESTIMONIAL FUND.*

ON October 13, 1891, Prof. Rudolph Virchow celebrates his seventieth birthday. His pupils and admirers intend to commemorate the occasion by presenting him with a testimonial in recognition of his splendid services to medical science. A large and representative Committee has been formed in Germany with the view of collecting the necessary contributions, but it has been felt that this ought essentially to be an international movement, inasmuch as Prof. Virchow's followers are not of one nation, but of all.

In accordance with this view the undersigned have formed themselves into a Committee, in order to give Prof. Virchow's British admirers the opportunity of testifying to the gratitude which every member of the profession feels towards the man whose work in cellular pathology has so vastly contributed towards the advance of modern medical science, and may fairly be said to have made every member of the profession his pupil.

The form in which the universal feeling of gratitude is to find expression has been decided upon by the original German Committee. A large gold portrait medal is to be presented to Prof. Virchow himself, and bronze replicas of the same to members of his family and to some scientific institutions. The surplus—which, no doubt, will be large—is to be handed over to Prof. Virchow for the furtherance, subject to his decision, of scientific work.

To carry out this project the undersigned cordially invite the co-operation of the profession in the United Kingdom. Subscriptions, which are not to exceed two guineas, may be sent to the Hon. Treasurer, Dr. Lauder Brunton, 10 Stratford Place, London, W., and will be duly acknowledged in the medical journals. Cheques to be made payable to "Virchow Testimonial Fund," and to be crossed.

(Signed) JAMES PAGET, Chairman.
LAUDER BRUNTON, Hon. Treasurer.
FELIX SEMON, } Hon. Secs.
VICTOR HORSLEY, }

*List of Committee of Virchow Testimonial Fund.*

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