writing papers. Communications with such figures are imposing as compared with those based on clinical data and experience, but it does not follow that the conclusions arrived at are any less scientific or reliable.—I am, etc.,

Cambridge, July 30th. A. E. BARCLAY.

PHYSIOLOGICAL STUDY OF ASTHMA.

SIR,—In my letter of July 20th (p. 121) I pointed out that the type of breathing which affords the maximum respiratory interchange in the lungs is that in which the mean size of the chest is increased and breathing takes about this increased mean. This type of breathing not only secures a maximum respiratory area, but a minimum resistance to the blood flow from the right to the left heart. In order to maximize the mean size of the lungs the deepest possible inspirations are taken, while expirations stop far short of their maximum: full expirations would fail to increase the mean size of the lungs, and would greatly impede the pulmonary circulation.

Accordingly we find that both in physiological breathlessness and in the breathlessness of organic heart and lung disease the chest is expanded and the respiratory movements take place about this increased mean. Inspirations tend to be powerful; expirations (with certain exceptions) moderate. In physiological breathlessness, indeed, expirations are effected by little more than elastic recoil.

Let us now suppose a case in which the bronchioles are narrowed (whether by muscular spasm or urticurial swelling of their mucous membrane) to a degree seriously interfering with the passage of air through them; the chest would expand in accordance with the principles enunciated, inspirations would be violent, while (for reasons given in my previous letter) expirations would be cautious and prolonged.

While admitting that Dr. Watson-Williams's ingenious hypothesis would explain in a neat and seductive fashion the phenomena of the asthmatic attack, I suggest that my explanation brings the pathology of asthmatic breathing more into line with other types of dyspnoea than Dr. Watson-Williams's view, attractive though it be.

The effective expansion of the collapsed lungs of the newborn baby is, as Dr. Watson-Williams observes, facilitated by obstructing the easy exit of expired air. Such obstruction, he suggests, is afforded by an (exaggerated) expiratory contraction of the bronchioles; but he omits to take into consideration what I conceive to be a much more effective mechanism for securing adequate expansion of the collapsed lungs—namely, the baby's lusty cries; the forcible expirations thus resulting, by increasing intrapulmonary air pressure, provide, I suggest, a more effectual means of opening up collapsed vesicles than that advocated by Dr. Watson-Williams.—I am, etc.,

London, Aug. 1st. HARRY CAMPBELL.

GENERAL CONVULSIONS UNDER ETHER.

SIR,—Since first describing general convulsions occurring under surgical anaesthesia in the *British Medical Journal* (May 28th, 1927, p. 956) a number of correspondents have discussed in your columns their experiences, and I should like now to restate my views in the light of subsequent manifestations of this rather obscure phenomenon.

The advice as to treatment which I originally gave I have found completely successful, so that though I have little doubt that deaths still sometimes occur (and several have been reported since I wrote), I have had no more. I believe it well, therefore, to repeat this advice. It is necessary to recognize the very beginning of the spasm, and immediately remove all coverings and sources of vapour away from the face, giving free access of fresh air. The recovery from the anaesthetic is delayed in cases where the convulsions have been well established, but if any more anaesthetic is needed then it should be chloroform.

Many suggestions have been made as to the cause of the convulsions: I am quite sure that it is not due to some decomposition or impurity in ether. These impurities exist in very small quantities, and though often accused of various offences, have never been convicted by a majority of anaesthetists. In the Clover inhaler and its modifications, so much used a few years ago, where the ether had an excellent chance of decomposition, no cases were reported. For many years methylated ether was used exclusively at the Royal Infirmary here, before a case was noticed; moreover, without doubt, our ether is generally purer now than formerly, not less pure. Many cases have occurred where fresh bottles of a good brand had been used by a method which precludes the theory of decomposition subsequent to opening them. One such I remember witnessing where the ether was poured on to lint without decanting it into any other bottle. Though isolated cases may tempt one to this hypothesis, there is scarcely any real evidence in favour, and plenty against.

The "bomb" apparatus has been blamed, but so many cases have occurred without it that it cannot be that. In the last case that was reported to me ether was given by the Shipway apparatus; the patient was a boy, and he died. It is said that the bomb apparatus, which I have used continuously for the last ten years, is likely to decompose the ether. Perhaps it is, but, if it does, the products formed are harmless, or I would not be using it now. In the last case but one that I had, I made an experiment; I returned to ether from the bomb, after the convulsions, which had rapidly been advancing, had subsided, and before the operation was half done. In this case the above theories (of decomposition or impurities) were to some extent put to the test: convulsions did not recur, and there was no ill effect.

My view is this, after seeing a considerable number of such cases (almost twenty): it is the method which is at fault—the way the patient is handled; anaesthetists will know what I mean. It is not the ether itself (or anything in the ether), but something besides. I believe the breathing is earliest affected, and that this is directly responsible for an extension of irregular muscular action from the respiratory muscles to those of the rest of the body; and when I repeat that it is an excess of CO_2 which affects it, I mean in conjunction with the other factors—etheration, toxaemia, pyrexia, idiosyncrasy, and, perhaps not least, an excess of oxygen. Usually an excess of CO_2 in the blood has been manifested by a corresponding anoxaemia, but nowadays that is not allowed to occur; so that accumulation of it would be marked by the good colour. We cannot always handle or guide a patient as we could wish; but are sometimes forced, by his reaction to it, to push the anaesthetic, as it were, into him, cover his face with towels, or otherwise adopt measures which we might not have desired. These methods, I suggest, are the cause of a state of things the outcome of which is general convulsions.—I am etc.,

Manchester, July 23rd. K. B. PINSON.

GAS-OXYGEN ANAESTHESIA.

SIR,—I have inquired of many students from various hospitals and have found none who have been taught gas and oxygen anaesthesia. Dr. Slaughter (July 20th, p. 124) seems to have a very poor estimate of my opinion, so I will quote others which may possibly carry more weight.

I received this week an article entitled "Anaesthesia in thoracic operations," by C. Langton Hewer, M.B. It is marked "With compliments, v. pp. 78–79." On referring to page 78, I find specially marked:

> "Apparatus: The type of apparatus employed will naturally depend on the preference of the individual anaesthetist and upon local conveniences. If expense and portability are of no object, the elaborate American machines such as the Hiedbrink and McKesson are very efficient and permit of very fine mixture control. For ordinary use, however, a much simpler and more portable sight-feed apparatus can be used with every satisfaction. The writer employs a Boyle's machine with a modified sight-feed as shown."

Evidently Dr. Hewer considers Boyle's machine inferior to the American ones, but uses it on account of expense and portability. The reason I use my machine is solely on account of efficiency—no other reason counts with me. The argument about portability will not stand, because the portability of all gas machines is limited by the gas cylinders, and whatever machine is used these are an unavoidable drawback. I do not like the argument of expense when imported into a medical discussion, as it savours of commercialism; still, even that is not altogether in favour of Boyle's apparatus. When it is realized that