

should not be adopted, as Dr. Rogers had fairly and considerably urged, in populous places. There was at the present time a strong feeling on the subject of out-relief, and an opinion that medical relief was too freely given; but an extension of the dispensary system was a different question, and he thanked them for the information they had placed before him.

The deputation thanked the Minister and retired.

Correspondence.

"Audi alteram partem."

DENTAL ANÆSTHETICS AND HEART DISEASE.

To the Editor of THE LANCET.

SIR,—Mr. Clover raises some objections to my explanation of the action of nitrous-oxide gas, and he suggests a different interpretation of the phenomena. We agree as to the fact that the pulse, which for a time is rendered full and throbbing by the inhalation of the gas, subsequently, in some cases—and in every case where the inhalation is pushed to extremes—vanishes entirely. I need not here repeat the explanation of these facts which I suggested in THE LANCET of May 20th.

That Mr. Clover should have given the gas to more than eleven thousand persons without a fatal result is evidence of the care and skill with which he administers that agent, but his great experience is not in itself sufficient to establish the truth of his theory. He states that he has met with no case "showing signs or symptoms of the heart being dilated by the process." I would remind Mr. Clover that *distension* of the heart's cavities does not necessarily imply *dilatation* discoverable by physical signs; but the question arises, What are the signs and symptoms of dilatation of the heart in such cases? It is not unlikely that in persons with normal (not emphysematous) lungs, and with thin chest walls, careful percussion and palpation might discover some dilatation of the right cavities; but this would be less decided than might *a priori* be expected, because at the time when the right cavities are most distended the left are comparatively empty and flaccid. I have never percussed the cardiac area of a patient narcotised by nitrous oxide; has Mr. Clover done so with a negative result as regards evidence of dilatation? If not, he has no right to assume that no signs of cardiac dilatation exist. Then, as to "symptoms" of dilatation, I confidently assert, from what I have seen of experiments upon animals, that when, during the stage of pulmonary obstruction, the systemic veins and capillaries are sufficiently distended with venous blood to cause lividity of the surface, the right cavities of the heart, and especially the auricle, are not only distended, but actually dilated, in consequence of the obstruction in front.

I am at a loss to understand the physiological meaning of Mr. Clover's assertion that, admitting the existence of obstruction in the lungs, "there would be no risk of distension of the right heart, for by this time its contractile power has almost gone." Surely the diminution of contractile power is one of the elements contributing to dilatation of a muscular cavity. Everyone who administers nitrous oxide should bear in mind the fact that during the stage of lividity the right cavities of the heart are distended, and probably dilated, and when, as often happens at the same time, the muscles of the trunk and limbs are convulsively contracted, the pressure of the contracting muscles upon the systemic veins drives the blood forcibly towards the right cavities of the heart, and thus increases the distension. Mr. Clover asks why, if the increased fullness of the pulse is the result of contraction of the systemic arterioles, the skin is not rendered visibly pallid? I reply, because the resistance offered by the contracting arterioles immediately excites more forcible contraction of the left ventricle, so that the amount of blood in the capillaries is not obviously lessened.

Mr. Clover's statement that the cessation of the pulse in the advanced stage of nitrous oxide anæsthesia is explained by the failure of the heart's action consequent on want of

oxygen in the blood is a revival of Bichat's long since refuted and exploded doctrine, and it is inconsistent with unquestionable facts, in particular with the condition of the heart's cavities as seen in animals killed by the gas, and the evidence of systemic venous distension afforded by the lividity so commonly observed in the human subject. Moreover, if the cessation of the heart's action were caused by the presence of black blood in its tissues, the circulation could not be so rapidly—so almost instantaneously—restored as it is by the readmission of atmospheric air to the lungs.

The phenomena of nitrous oxide anæsthesia are essentially the same as those which result from apnoea, or, as it is commonly called asphyxia, caused by the exclusion of atmospheric air. Dr. John Reid, in his famous paper "On the order of succession in which the vital actions are arrested in asphyxia," a paper with which everyone who discusses this question ought to be thoroughly familiar, was the first to demonstrate that, while the primary effect of the entrance of unaerated blood into the systemic arteries is to cause an impeded passage of blood through the minute systemic vessels, and a consequent increase of arterial tension, as shown by the dynamometer, the ultimate result is to call forth so great an obstruction to the passage of blood through the lungs, that while the left side of the heart and the systemic arteries are comparatively empty, the right cavities and the systemic veins are filled to repletion.

Dr. Reid's observations and conclusions have been completely confirmed by more recent experimenters, who have called to their aid that most invaluable agent, curare, by means of which the disturbing influence of the animal's struggles upon the blood pressure is obviated. I am indebted to my friend and former colleague, Professor Rutherford, for the opportunity of witnessing the phenomena of apnoea (asphyxia) in a curarised dog whose pericardium had been opened so as to expose to view the surface of the various cavities of the heart. The suspension of the respiratory movements, and the consequent passage of black blood into the systemic arteries, are immediately attended with an increase of arterial tension, as indicated by the kymograph connected with the tube of a dynamometer introduced into the carotid. For a period of about two minutes the arterial pressure steadily rises, and with this there is seen to occur an increasing distension of the *left* cavities of the heart, the left auricle swelling up and assuming a smooth, globular form like a distended india-rubber ball. Then the phenomena rather rapidly change: the *right* cavities of the heart become distended and dilated, while the left gradually diminish in size, until, at the moment of the animal's death, the collapsed left cavities are almost concealed by the greatly distended and dilated right cavities. Meanwhile, the pressure in the systemic arteries, as indicated by the dynamometer in the carotid, has rapidly fallen in consequence of the defective blood supply to the left side of the heart resulting from the obstruction in the lungs. In this experiment we have demonstrative evidence of the influence of an impediment which can only result from contraction of the muscular arterioles, in causing not only an increase of arterial pressure, but also distension, and even dilatation, first of the left cavities, and secondly of the right cavities of the heart in the different stages of asphyxia. The phenomena of nitrous oxide anæsthesia are precisely similar, but they occur with greater rapidity, because by the inhalation of that gas the blood is more rapidly deprived of its oxygen than it is by the mere exclusion of atmospheric air from the lungs.

The physiological interest and the practical importance of the subject must be my apology for the length of this communication.

I am, Sir, your obedient servant,
Savile-row, June 12, 1876. GEORGE JOHNSON.

THE PROFESSION OF DENTAL SURGERY.

To the Editor of THE LANCET.

SIR,—The attempt to bring the influence of the medical profession to bear upon the training of dental surgeons can be of advantage only when medical men are made fully acquainted with the scope and requirements of dental surgery, an accurate knowledge of which they do not at present possess. The existence of special journals, while