

the full pulse, and the anxiety of countenance; whilst, on the other hand, the diarrhoea, together with the abundant discharge of lochia and urine, would tend to negative the probability of that disease being present. Again, admitting that peritonitis were present, it was doubtful whether it existed independently of any other affection, or whether it were solely *sympathetic*. However, it was evident that inflammatory action existed. I accordingly reopened the vein, and allowed blood to flow *ad deliquium*, and I followed up the bleeding with these remedies:—

R *Protochloride of mercury*, three grains;
Powdered opium, one grain;
Potassio-tartrate of antimony, a sixth of a grain;
Conserve of roses, as much as necessary to form a pill, to be taken every three hours.

21. Rather better this morning; pulse keeps up, 120, full and bounding; countenance not quite so anxious; pain still acute on pressure; blood drawn last night cupped and buffed. Mr. Moon again abstracted blood to fainting. Repeat the pills.

22. Much better; pulse 120, but softer; pain on pressure much decreased; urine plentiful; bowels not acted. The parts look angry; a large slough visible in the centre. It was now determined to support the powers, as the probability of gangrene seemed very great. Three grains of the sulphate of quinine were given every four hours in solution, followed by five grains of the soap and opium pill; a suppository of three grains of opium was inserted into the rectum, and a yeast-poultice was directed to be constantly applied to the lacerated parts, together with a lotion containing the disinfecting solution of chloride of lime.

23. Considerably better; countenance more cheerful; abdominal pain not quite gone; the bowels have not acted; pulse 120; skin moist. Ordered a draught of castor oil and turpentine, and eight leeches to the abdomen.

24. Much the same; the draught has acted copiously; the passage of the *fæces* does not occasion much pain, nor does it interfere with the unison of the parts; slough came away; parts underneath look decidedly healthy; has passed no water since yesterday; three pints of high-coloured urine were drawn off by means of the catheter. Continue the use of the quinine.

25. The daily introduction of the catheter has become necessary.

Sept. 12. The patient declares herself to be now quite well, suffering no inconvenience from the parts, which she says are quite healed.

September, 15, 1843.

THEORY OF ANIMAL HEAT.

To the Editor of THE LANCET.

SIR,—I was much surprised to perceive in THE LANCET for September 2, 1843, that Mr. Winter, of Guildford, has attempted to appropriate some views of mine with regard to animal heat, which I published in the "Philosophical Magazine" as far back as March, 1839. Mr. Winter concludes his essay with these words,—“If there be any merit in this essay it consists in the assertion of the discovery of a principle in physics, *i.e.*, that the distention of elastic bodies generates heat, and the endeavour to apply that principle to account for the production of the thermal properties of animals.” Now, Sir, this notion so closely, nay, so *exactly*, resembles my theory, that I shall feel obliged by your republishing the following account of it, as it appeared in the "Philosophical Magazine" in 1839. I am, Sir, your obedient servant,

J. M. WINN.

Truro, September 21, 1843.

“On a Remarkable Property of the Arteries, considered as a Cause of Animal Heat. By J. M. WINN, M.D.

“About three years since, whilst making a few experiments with caoutchouc, I was forcibly struck with the property it possesses of evolving heat when suddenly stretched, and was led at the time to infer the probability of other bodies being similarly endowed. The elastic coat of arteries especially, from the mechanical resemblance it bears to caoutchouc, appeared to be one of the substances most likely to exhibit this calefactory principle; and in the event of this being the case, it would not be unreasonable to conclude that the incessant contractions and dilatations of the arteries during life must form an efficient source of animal heat.

“During the past week I was induced to resume the subject afresh, and upon making an experiment with part of the aorta of a bullock, I felt much gratification in being able to verify my previous conjecture. The experiment was performed in the following manner:—Having cut off a circular portion of the descending arch of the aorta, about an inch in length, I laid it open and carefully dissected out the elastic coat, and taking hold of it by each extremity, I pulled it to and fro with a continuous jerking motion (in imitation of the systole and diastole of the artery), for the space of about a minute, when, placing it upon the bulb of a thermometer, I had the satisfaction to find that after it had remained two minutes the mercury had risen as many degrees. On removing the thermometer the heat immediately began to diminish. To be certain that the heat did not arise from any other source than the one in question, I took the precaution of covering my fingers with a double layer of flannel to

prevent the communication of heat from the body; I also covered my mouth with a handkerchief to guard against the warm breath affecting the thermometer whilst watching the progress of the experiment. I may likewise state that the experiment was performed in a room without a fire, the temperature of the air at the time being 55° . There were several difficulties to contend with during the investigation, and it was not until after repeated trials that the experiment succeeded to my satisfaction. The chief impediment, I think, must have been owing to the moisture of the artery, which, by its evaporation, must have had a constant tendency to carry off the heat. Having, however, performed the experiment twice consecutively in the same satisfactory manner, I think there can be but little doubt entertained as to its conclusiveness. My attention was often arrested, whilst conducting the experiments, by the striking mechanical analogies between caoutchouc and the elastic coat of arteries. Like the former, the latter could be elongated to twice its ordinary length, and on withdrawing the tension would return to its usual dimensions with considerable force and a snapping noise. I was also surprised to find, on slightly drying it, that it would erase black-lead pencil marks from paper without leaving a stain. This latter circumstance is perhaps of trifling importance; it serves, however, to show that strong mechanical resemblance may exist between bodies widely differing in their chemical properties.

"From the foregoing observations I think I am entitled to conclude that the whole of the heat developed in the animal economy can now be satisfactorily explained. Physiologists have often proved that the greater part of animal heat is occasioned by the chemical changes which take place during respiration; there always remained, however, a portion which could not be referred to that source, but which can now, I consider, be fully accounted for by the mechanical action of the arteries. The precise quantity of heat given off during each beat of an artery it would be exceedingly difficult, perhaps impossible, to discover; but if we admit the development of only a very small quantity, it necessarily follows, from the circumstance of the action of the arteries being an incessant operation during life, that the heat must quickly accumulate to a great extent, and that the body, unless cooled by the functions of the skin and lungs, would in a short space of time become preternaturally hot.

"The following physiological and pathological facts appear to corroborate the view I have taken of the mechanical source of heat:—1st, the minute distribution of the arteries to every part of the system, ensures a general and equal distribution of heat; 2ndly, the ossification of the arteries in old

age, by diminishing their elasticity, is a probable cause of the diminution of animal heat at the close of life; 3rdly, the increased warmth of the body from exercise appears to be more readily explicable upon the principle of increased force in the arteries, rather than that of increased vigour in the functions of the lungs, inasmuch as the immediate effect of exercise is evidently to embarrass the breathing, as shown by the hurried respiration; 4thly, in many diseases of the lungs, where its functions are all at fault, at a time when the arteries are beating with increased violence, the heat of the body is found to be above the usual standard; 5thly, medicines which diminish the contractility and elasticity of the arteries almost invariably reduce the heat of the body; 6thly, the heat of local inflammations, in cases where the constitution does not sympathise to any extent, cannot be easily referred to any other source, as the arteries immediately in the neighbourhood of the affected part are throbbing with violence at a time when their capillaries (which are supposed to play so large a share in the chemical theory of heat) are generally considered to have their action entirely arrested. Many facts of a similar nature could be enumerated, but enough I think has been stated to establish the truth of the theory in question.

"Of the nature of the mechanical force I have been investigating little can be said; it may possibly be a kind of intermolecular friction. It is clearly, however, of a different nature from ordinary friction, and which has also been considered a cause of animal heat; but I think erroneously so, for on examining the mechanism of the human body we find that everywhere the most efficient means of defence have been provided against its effects, as seen in the various synovial, mucous, and serous membranes, &c. It is not the province, however, of the physiologist to speculate on the essential nature of mechanical or vital forces. His legitimate object, in the present state of the science, would seem to be that of analysing the simplest operations in the human body; to aim first at discovering the innumerable important processes that are carried on through the influence of physical agents, before he presumes to explain the higher and more mysterious principle of life; neither should he hastily call the vital power to his aid, to explain a phenomenon, such as heat, that is known to be common to every kind of matter, and which can be produced by a variety of physical forces independent of life.

"Truro, Nov. 8, 1838."

THE first lunatic asylum of which we have any record was founded at Jerusalem, in the sixth century, for those "poor monks whom distempered fanaticism had deprived of reason."