

any journey, seeing these pills are not every where to be had, they would be sure to carry with them one or two of them. The same care did I also take, above twenty years ago, for my sons, when I sent them abroad to the university; instructing them in my way of proceeding in the cure as well of this disease, as of the griping diarrhoea before spoken of, and also in the manner of preservation from and cure in the plague: wherein, notwithstanding, I advised them to consult the physicians of the place, that so the cure might be the more certain and speedy.

As concerning diet, I have spoken very largely in my French treatise; where I have said, that for their ordinary drink, the sick parties must take water and verd-juice, of each a like quantity mixt together; that is to say, the quantity of a cup and a half of either, with the yolk of an egg boiled in it, with a small quantity of sugar. And if the party be not very thirsty, he may then take a draught of red wine; or where that cannot be had, of old white wine: with which, if need be, you may mix water, with a little cinnamon boiled in it; you may allow your patients a draught of small ale, so it be clear. He may also have made him several kinds of broths, of the aforesaid verd-juice; or white wine, with water, sugar, and the yolk of eggs mixed with it; restorative jellies also; and a toast of white bread in wine mixed with water, and with a little sugar put upon it, are here of very good use. And whatsoever he takes either of meats, or drinks, he must take them cold; and least, by drinking too much, his evacuations should be the more violent upon him, he may sometimes allay his thirst, in some measure, by taking two or three spoonfuls of wine and water, mixed together in equal quantities, with a little sugar, and juice of citron added to it, to make it relish the better. He may also take a slice or two of citron (the peel taken off,) rolled about in sugar. Conserves of red currants, and of berries and the like, which are both cooling and astringent, and also pleasant to the taste, are here of good use also.

VI.—On the Distress and Exhaustion consequent to Exertion at great Elevations.

To the Editor of the Gleanings in Science.

SIR,

If the following observations are deemed worthy of a place amongst your "Gleanings" I shall feel obliged by their insertion. They relate to a subject which, comparatively speaking, but few individuals have had an opportunity of observing to any great extent, viz. the difficulty of respiration, and consequent fatigue and inability to proceed above a few paces at a time, up an ascent, in situations of considerable elevation above the level of the sea. I am not aware of any thing having been written on this subject, beyond the facts just mentioned; and having been placed in situations favorable for repeated observations relating to it, I determined on making such remarks as might possibly tend towards its elucidation. One of the first ideas which occurred to me on first experiencing this feeling, was, to try the state of my pulse; and certainly, whatever its remote cause, it appears to be connected with the rapid circulation of the blood; as I found my pulse rise from 64, its usual rate, to 160 beats in a minute; the inspirations being in proportion. This effect was produced in me, I think, at about the height of 12 000 or 13 000 feet, where, unless the road was unusually steep, I was enabled to take 30 or even 40 paces without being under the necessity of stopping from fatigue, (particularly felt in the loins and legs,) and the impossibility of making further progress without resting; but whatever the distance I was enabled to accomplish at one time, whenever my pulse rose to 160, I was compelled to rest: and a very short one restored my strength. As I gained a greater elevation, the number of paces I could take, decreased in proportion; till having ascended to the height of about 17 000 feet, the ascent being rather steep, I found myself quite unequal to the exertion of advancing even six steps, without being completely exhausted; and without the assistance of two men (Bhoteahs) accustomed to travel at such elevations, and a *jabbu* (an animal bred between the Tartar *yak* and common cow), to whose tail I tied myself, (it being too weak, from want of food for three days, to carry me, as was intended,) I should never have reached the summit of the pass, which proved by barometrical measurement to be 17 800 feet, the column of mercury being only a little more than 15 inches—and even with their combined aid I did not accomplish it without very severe fatigue. This sensation is experienced by the natives, though in a less degree; and they attribute it to the poisonous exhalations

of a plant; (the monks-hood,) which grows at the height of about 12 000 feet, and perhaps somewhat higher; but so far from its being found at the height I ascended to, nothing of the vegetable kingdom was to be seen, not even a blade of grass or patch of moss; which I remarked to them. Even the natives are said to suffer so much, as sometimes to fall down in a state of insensibility; and this I believe would have occurred to me, had I exerted myself, so as to have caused my pulse to rise above 160. The height to which this may be raised, will, of course, vary with the constitution and habits of the individual, as I tried the pulse of a sepoy (an inhabitant of the lower mountains,) which rose to 172—mine never exceeded 160 on level ground. In descending, however elevated, I never experienced any difficulty in breathing, however far I walked.

I am not aware that any one save myself, ever tried the state of his pulse in similar situations; my trials have been frequent, and made with a watch with second hand. But although I have proved the extraordinary increase of the pulse to be connected with the feeling, this circumstance in itself cannot be considered as a satisfactory elucidation of the matter; much yet remains for discussion, regarding the cause of this increase of the circulation. That the rarefied state of the air at great elevations, being insufficient for the due supply of the lungs, will be pronounced to be the sole cause by many of your readers, is probable enough; as it may be said, that the lungs require a certain quantity of air to keep them in proper action, and that in proportion as it is rarefied, so much oftener must the person breathe, and consequently so much more must the pulse increase. But if this were the true solution, how happens it that the breathing is not affected, or the pulse accelerated, when a person is stationary and undergoing no fatigue at the same elevation, which I have proved to be the case; or even when he is walking along level ground, or in descending? This last was proved by my companion and myself, descending in about 20 minutes, running when the ground admitted, a distance which had taken us a full hour to ascend; without experiencing any inconvenience in breathing, beyond what we should have felt in lower situations. That the rarefaction of the air is one cause of this debilitating feeling cannot be doubted, and the difficulty lies in explaining the fact of no inconvenience in breathing being felt at the height of 17 800 feet whilst in a state of rest, with that of every particle of strength being completely prostrated in taking six paces on my ascent to this great elevation. It would be a natural supposition that the inspirations must be in proportion to the density of the atmosphere, and that the state of a person's pulse might be told on knowing the height of the column of mercury which was supported by the air we breathed, for the pulse and the breathing will, I imagine, always bear a certain proportion to each other; but this supposition I have proved to be erroneous, and that, however elevated the place, the usual number of inspirations are in a state of rest just sufficient for the due supply of the lungs and support of the circulation, as the air is at the level of the sea. If then, notwithstanding its rarity, the air proves to be an equivalent to that at the level of the sea in a state of rest, how is the circumstance to be accounted for, that I could not take six steps, which was also the case with my companion, without being completely exhausted, and that my pulse rose from 64 to 160. The breathing I conceive may act on the pulse or *vice versa*, as I presume the latter is the case with a person labouring under the effect of violent fever; and the increased circulation may require a proportional supply of fresh air; but the feelings which I experienced, did they derive their source from the immediate increase of the circulation of the blood, or from the want of a due supply of air to the lungs, as the air, notwithstanding its tenuity, was sufficient in a state of rest? We must suppose they were occasioned by the former. Supposing the inference I have drawn from the facts, which I have related, should be correct, the next question is, What is the cause of this rapid circulation? As at the level of the sea, so at this elevation, we must suppose it to have its origin from violent exertion. But when six paces taken at the rate of 60 or 70 in the minute, produce a more powerful effect on the system than perhaps some hundreds taken at the utmost speed in the former situation; and as this effect is not produced in walking on level ground; must it not arise from the weight of the body which a person has to raise? Remove this, a measure I have frequently had recourse to by fastening a rope round my body, and causing a couple of men to assist in pulling me up, and the fatigue is comparatively trifling.

Having traced the subject so far, to the best of my ability, I shall not further trespass on your pages with any crude attempts to bring to light the ultimate cause of the feeling, but leave its further elucidation to some abler pen, should the facts which I have related draw the attention of such to the subject.

J. M.