

from the scarlet eruption ; and the passage from the back of the fauces into the ear having lain open exposed to its malign influence, an abscess has been formed in the tympanum, which has been destroyed ; otherwise the bones could not come out at the other ear."

He had learned to read before this unhappy accident, and the people about him write down what they want to make him understand ; at least at present, till they have found out a readier method.

LI. *Observations concerning the Body of his late Majesty, October 26, 1760, by Frank Nicholls, M. D. F. R. S. Physician to his late Majesty.*

*To the Right Honourable George Earl of Macclesfield,
President of the Royal Society.*

My Lord,

Read Nov. 26, 1761. **T**HE inclosed papers have been laid before the Lord Chamberlain, for his Majesty's inspection ; and his Majesty's answer was, That he saw no reason, why they may not be made public.

The bursting the ventricle of the heart is a case entirely unknown in physical writers ; and must depend on many circumstances, which rarely coincide.

I have used my best endeavours, to give a clear and satisfactory account of this very extraordinary affair ; and I hope I have succeeded : but, if any

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thing abstruse should appear, I trust, it will be attributed rather to the nature of the case, than to any want of consideration or respect for your Lordship, or the Society, in,

My Lord,

Your Lordship's

most obedient,

and most humble servant,

October 20, 1761.

Fran. Nicholls.

*To the Right Honourable the Earl of Macclesfield,
President of the Royal Society.*

My Lord,

THE circumstances attending the death of the late King being such, as are not (I apprehend) to be met with in any of the records of physical cases, and such, as, from the nature of the parts concerned, are not easily to be accounted for; I presume it will be agreeable to your Lordship, to the Society in which you preside, and to the learned world in general, if I lay before your Lordship, and the Society, a minute detail of what occurred on that remarkable and melancholy occasion; with such explanations, as arise from the circumstances of the case.

According to the report of the pages then in waiting, about seven in the morning, Saturday, October 25th, a noise was somewhere heard, as if a large billet had tumbled down; and, upon enquiry, his Majesty

Majesty was found fallen on the ground, speechless and motionless, with a slight contused wound on his right temple. He appeared to have just come from his necessary-stool, and as if going to open his escritoir. Mr. Andrews (at that time surgeon to the household) attempted to take away some blood; but in vain, as no signs of sense, or motion, were observed, from the time of his fall.

The next day, (Sunday, October the 26th) by order of the Lord Chamberlain, I attended, with the two serjeant-surgeons, who were directed to open and embalm the Royal Body.

On opening the abdomen, all the parts therein contained were found in a natural and healthy state, except that some hydatides (or watery bladders) were found between the substance of each kidney, and its internal coat. These hydatides might, in time, have proved fatal, either by compressing and destroying the kidneys, so as to bring on an incurable suppression of urine; or, by discharging a lymph into the cavity of the abdomen, might have formed a dropsy, not to be removed by any medicines: but, in the present case, these hydatides were of no consequence, as none of them exceeded the bulk of a common walnut.

On opening the head, the brain was found in a healthy state, no-ways loaded with blood, either in its proper vessels, or in the contiguous sinuses of the dura mater.

Upon opening the chest, the lungs were in a natural state, free from every appearance of inflammation, or tubercle: but upon examining the heart, its pericardium was found distended, with a quantity of coagulated blood, nearly sufficient to fill a pint cup;

and, upon removing this blood, a round orifice appeared in the middle of the upper side of the right ventricle of the heart, large enough to admit the extremity of the little finger. Through this orifice, all the blood brought to the right ventricle had been discharged into the cavity of the pericardium; and, by that extravasated blood, confined between the heart and pericardium, the whole heart was very soon necessarily so compressed, as to prevent any blood contained in the veins from being forced into the auricles; which, therefore, with the ventricles, were found absolutely void of blood, either in a fluid or coagulated state.

As, therefore, no blood could be transmitted through the heart, from the instant that the extravasation was completed, so the heart could deliver none to the brain; and, in consequence, all the animal and vital motions, as they depend on the circulation of the blood through the brain, must necessarily have been stopped, from the same instant; and his Majesty must, therefore, have dropped down, and died instantaneously: And as the heart is insensible of acute and circumscribed pain, his death must have been attended with as little of that distress, which usually accompanies the separation of the soul and body, as was possible, under any circumstances whatsoever.

The above-mentioned appearances (as they shewed the immediate cause of his Majesty's death) were thought sufficient to form the report to his present Majesty, and his Council. But as the very eminent and amiable character of his late Majesty must make the nature of his death the object of every one's attention and inquiry; and as the case was exceedingly singular

ingular and extraordinary in itself; and as the heart must have been merely passive, and, consequently, there must have been some other concurrent circumstances necessary to produce such an effect; I judged, at the time, when the report was drawn, that a more minute and exact detail would not only be expected by the world, but would be highly proper, as our inquiry furnished sufficient matter.

Two questions naturally arise upon the face of our report; viz. by what means the right side of the heart became so charged with blood, as to be under a necessity of bursting? and how it could happen, that, as the ventricle (when under great distensions) generally makes one continued cavity with the auricle, and is much thicker and stronger than the auricle, the blood should, nevertheless, force its way, by bursting the ventricle, rather than the auricle, seemingly in contradiction to the known property of fluids, to force their way, where the resistance is least?

Upon examining the parts, we found the two great arteries, (the aorta and pulmonary artery, as far as they are contained within the pericardium) and the right ventricle of the heart stretched beyond their natural state; and, in the trunk of the aorta, we found a transverse fissure on its inner side, about an inch and half long, through which some blood had recently passed, under its external coat, and formed an elevated echymosis. This appearance shewed the true state of an incipient aneurism of the aorta; and confirmed the doctrine, which I had the honour to illustrate, by an experiment, to the satisfaction of the Society, in the Year 1728; [See the Philosophical Transactions, N^o 402.] viz. that the external coat of the artery

artery may (and does) often controul an impetus of the blood, capable of bursting the internal (or ligamentous, coat ; although this last is by much the thickest, and, seemingly, the strongest.

In regard to this distention of the aorta ; as his Majesty had, for some years, complained of frequent distresses and sinkings about the region of the heart ; and as his pulse was, of late years, observed to fall very much upon bleeding ; it is not doubted, but that this distension of the aorta had been of long standing, at least to some degree ; and, as the pulmonary artery was thereby necessarily compressed, and a resistance, greater than natural, thereby opposed to the blood's discharge out of the right ventricle, it is reasonable to conclude, that a distension and consequent weakness of the pulmonary artery and right ventricle, to some degree, were nearly coeval with that of the aorta. But that the aorta had suffered a more extraordinary and violent distension, immediately antecedent to the bursting of the ventricle, is evident, from the recent fissure of the aorta, and the consequent extravasation of blood between its coats. Now, as this increased and violent distension of the aorta must have been attended with a proportionate pressure upon the pulmonary artery, and, consequently, an increased opposition to the passage of the blood out of the right ventricle ; so that distension of the aorta must be considered, as the immediate cause of the right ventricle's being surcharged with blood, and consequently of its bursting.

The immediate cause of this distension of the aorta, as likewise of its being determined to that particular time, are naturally explicable, from his Majesty's
having

having been at the necessary-stool; as the office then required cannot be executed, but by such a pressure on all the contents of the lower belly, and, consequently, on the great descending artery, as must, of necessity, subject the trunk of the aorta, and all its upper branches, to a surcharge with blood continually increasing, in proportion as the pressure may happen to be continued longer, or exerted with greater violence, in consequence of a costive habit, or any other resistance.

As to the second question; viz. how it could happen, that the blood should force its way rather through the side of the ventricle than of the auricle? since it is well known, that when the ventricle is fully distended with fluids, they will easily pass back into the auricle; so that under such a distension, as the ventricle must have suffered, before it bursts, it should seem to have made one continued cavity with the auricle; of which cavity, the auricle, being by much the weakest part, must have been the most liable to a rupture. This certainly is the circumstance, in which the very great singularity of the case before us consists; and many difficulties offer against any obvious explanation.

Two circumstances, however, seem to throw some light on this obscure and difficult question. The first consists in the texture, connexions, and capacity, of the pericardium; the second, in the order, in which the several surcharges must have arisen.

The pericardium is a strong tendinous membrane, inelastic in every direction, containing the two auricles, the two ventricles, and the two great arteries, as in a purse: it is fixed to its contents at the back of the

two auricles, where, by its connexion, it surrounds the two venæ cavæ: hence, passing along the arch formed by the aorta, it descends to the pulmonary artery, and continues round the orifices of the pulmonary veins, firmly attached to these several parts in its passage. By these connexions, these parts are all fixed in their several stations, incapable of separating from each other, or shifting their situations, however they may happen to be compressed. The pericardium is generally said to serve as a defence to the heart; but that defence seems to consist chiefly, in preventing the right auricle from being stretched by the depressions (or complanations) of the diaphragm, in hunger and inspiration, and, by its bearing firmly against the sides of the auricles, to support and strengthen them against too great distensions: for the cavity of the pericardium seems to be but little more, than commensurate to the bulk of its contents, when one half of them are filled, and the other half empty. This will appear, upon endeavouring to fill the heart, with its auricles, and its two great arteries, with wax, at the same time, while it is inclosed in the pericardium; in which experiment, one or other of these cavities will be found to have been so compressed by the pericardium, as to have refused a free admittance to the wax, and will, therefore, be found proportionally empty.

The inelastic texture, connexions, and capacity, of the pericardium, being thus stated, let us now consider the order, in which the several distensions must have arisen, in the two great arteries and cavities of the heart, with the necessary effects of those distensions

sions on the pericardium, and the parts which it contains.

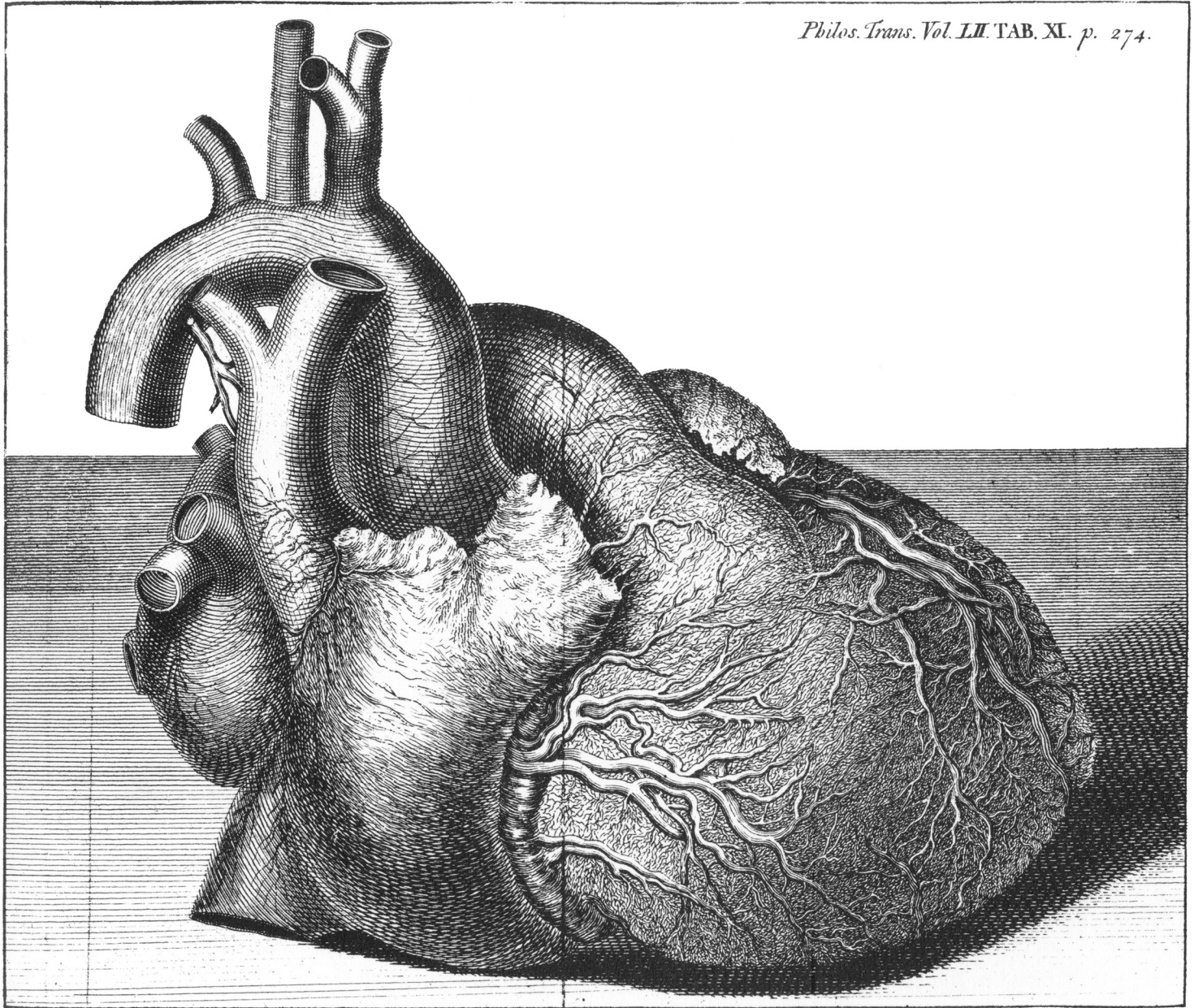
The first distension (and this a great and violent one) must have arisen in the aorta; and the consequent pressure on the pulmonary artery (by the aorta so distended) must have been sufficient (either by degrees or at once) to stop the blood's discharge out of the right ventricle and pulmonary artery, and to distend both those cavities greatly beyond their natural state of repletion. So that, under these circumstances, the two great arteries, and the right ventricle, must have been under an extraordinary and continued distension (and, consequently, an increase of bulk) at the same time; whereas, in the natural state of the body, these three cavities are alternately dilated and contracted, and the right ventricle is always proportionally diminished in bulk, as the pulmonary artery is increased, and vice versa. So that, with respect to these three great cavities, (supposing that their several distensions had been no greater than natural) the pericardium must have been obliged to contain one third more in proportion, than its capacity was formed to receive. During this time, the blood being stopped in its passage through the lungs, and its afflux to the left auricle and ventricle being thereby suspended, the left auricle and ventricle must have remained in a contracted state; in consequence of which, the right ventricle had ample space in the pericardium, to admit that degree of distension, which was previously requisite for its bursting. But the right auricle (being fixed to its station by its connections with the left auricle and the pericardium, and being firmly compressed

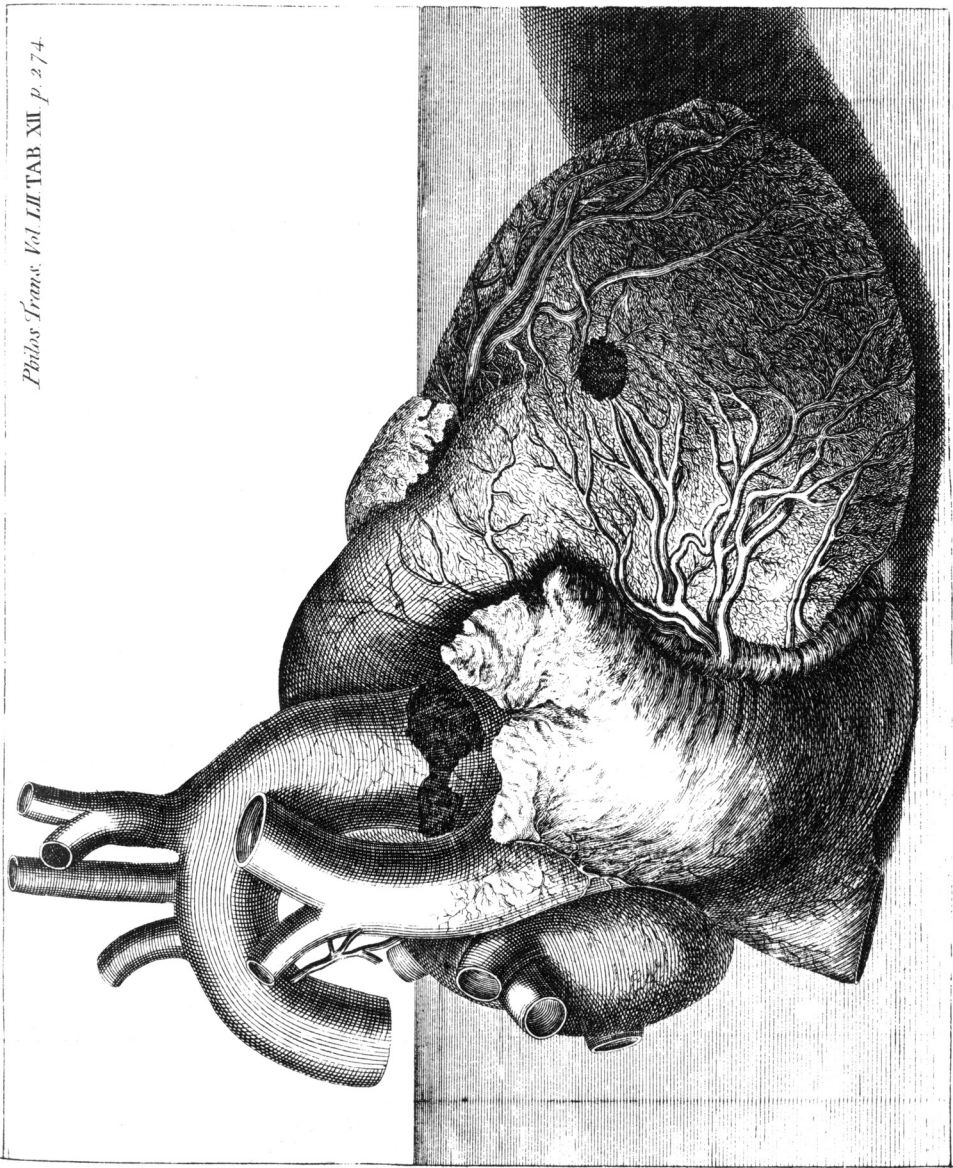
against the pericardium, by the aorta, the pulmonary artery, and the right ventricle, all which appear to have been, at this time, greatly distended beyond their natural bulk) must have been thereby deprived of the space in the pericardium, necessary to admit of its being distended; and the whole surcharge and distension must, by the pressure of the pericardium on the auricle, necessarily have been confined to the right ventricle, till it burst.

Had these surcharges arisen in any other order, their effects must have been greatly different: as for instance, if the surcharge in the right ventricle had arisen from any other pressure, than from a distension of the aorta, the extraordinary bulk of the aorta, and its pressure against the pulmonary artery, would not have existed, and the right auricle, not being then compressed against the pericardium, would have been at liberty to distend, till the blood had made its way through its sides.

In confirmation of this power, here attributed to the pericardium, of strengthening and supporting its contained parts, let it be observed, that, in the case under consideration, the place of the fissure in the aorta is precisely where the pressure of the pericardium is kept off from the aorta, to a considerable degree, by the situation of the right auricle and the pulmonary artery.

My Lord, in order to give a clear and distinct idea of this very extraordinary case, I have here annexed two prints; [*Vide Tab. XI. & XII.*] the first of which shews the heart, as it appears when all its cavities and blood-vessels are filled with wax; the other is the same print, having the orifice in the right
ventricle,





ventricle, and the extravasation covering the fissure in the aorta, exactly marked, as they appeared to,

My Lord,

Your Lordship's

most obedient

and most humble servant,

Frank Nicholls.

LII. *Of the Irregularities in the planetary Motions, caused by the mutual Attraction of the Planets: In a Letter to Charles Morton, M. D. Secretary to the Royal Society, by Charles Walmesley, F. R. S. and Member of the Royal Academy of Sciences at Berlin, and of the Institute at Bologna.*

S I R,

Read Dec. 10,
1761.

Finding that the influence, which the primary planets have upon one another, to disturb mutually their motions, had been but little considered, I thought it a subject worthy of examination. The force of the sun, to disturb the moon's motion, flows from the general principle of *gravitation*, and has been fully ascertained, both by theory and observation; and it follows, from the