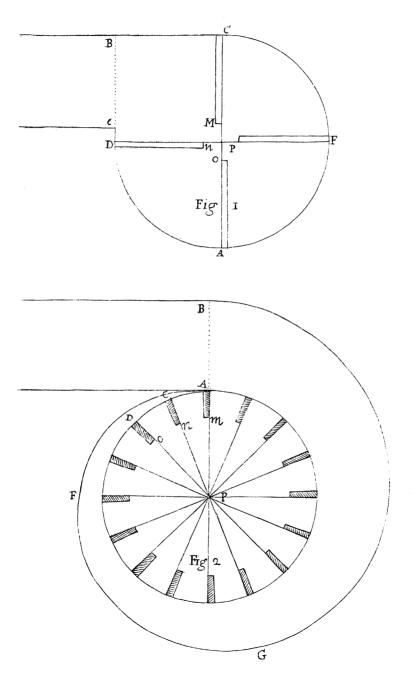
Philos = Transact = Nº 300



## ( 1990 )

I. Part of a Letter from Mr D. Papin to Dr Frederick Slare, Fellow of the College of Phylicians and of the Royal Society, concerning an Improvement of the Hessian Bellows, &c.

Am butie at present for a Coal-mine, which hath been left off because of the impurity of the Air : I have therefore improved the Hellian Bellows: I don't question but you have feen that new contrivance, printed Lipfie in Actis Eruditorum anno 1699. with this Title, Rotatilis Suctor & Preffor Haffiacus: And it may be apply'd for Wind as well as for Water. At that time the shape of the Tympanum was Cylindric, as may be seen Fig. 1. where DAFC is the circumference: CP, DP, AP, are the Radii which bear the Wings Cm, Dn, Ao: CE is the aperture through which the Wind must be driven in the direction of the Tangent CB: And it may be observ'd that when the Engine is working, every Wing from the end of the aperture E, till it comes to the beginning of the fame aperture C, drive always the fame Air, with the fame fwiftnefs, and at the fame diftance from the Center : So that in perusing all that circumference, the Air doth find refistance by friction, and gets nothing at all I do therefore now make the circumference of the Tympanum in a Spiral shape, which is to be seen Fig. 2. where the Spiral circumference is AFGB, the Radii are AP, CP, DP, &c. The Wings are AM, CN, DO, Ge. The aperture is AB. And it is to be observed, that every Wing in going round drives new Air, because the Air which is first in motion finds place to recede from the Center towards the Spiral circumference ; and fo it gives room to new Air to come

come to the Wing: And when the Wings come near to the Aperture, they drive their new Air into the Aperture without any friction; and the Air which hath been first driven and removed from the Wing, cannot lofe its fwiftnefs, becaufe the Wings which continually follow do continually drive new Air, which keeps that which is before always in the fame fwiftnefs. This new shape of the Heffan Bellows affords also another advantage; because the Air in going round follows the Spiral line, which is nearer to the straight line than a Circular circumference: and when the Air comes to the Aperture, it gets into it without any lofs of fubstance; but in the Cylindrical Machine, Fig. 2. the Air doth always go round in a Circular circumference; and when it comes to the Aperture, the Wind is driven directly in the direction of the Tangent but just in the beginning at C; and afterwards the Impulfion is oblique : And this obliquity is always increasing until the Wing comes to the punctum A: Now it is known how much diminution fuch an obliquity can make to the strength. I believe therefore that this Spiral figure is a good improvement to this Engine. And indeed I have made such B llows where the Radius AP is but 10 # inches, the Wing A m 2 inches broad and 9 inches high; because the Tympanum is also so high, or little more; the Aperture AB is also 9 inches, or a little more, so that it makes a square hole. When I work this Engine with my Foot, it makes such a Wind that it may raile up two pounds weight; and without doubt a stronger Man could do much more: But this is more than sufficient for our purpose, fince we must but drive Air enough for the respiration of fuch Men that can work in the Mine; and we may eafily with Boards make Wooden Pipes, to carry the Wind to the very bottom : So that the Air within will be continually renewed as well as without.

His Serene Highness being gone to Shualbach, I mult expect his return to apply the Engine to the Mine; and I hope hope then I shall be able to impart the fuccels to the Royal Society.

About the Engine, proved before a Committee of Parliament, to demonstrate the power of Water expanded by Fire, I will tell you that we have here made very good Ex. periments of that matter before Winter. We have raifed Water to the heighth of 70 foot, by a very commodious way, which may be yet very much improv'd; and becaufe his Serene Highnels was defirous to fee fomewhat more, the Engine was left too long in the River, fo that the Ice broke it, and carried away part of the fame; and fince that time other defigns have been undertaken, fo that this Water Engine is not yet repaired : I hope in time we shall again work about that as well as about a Furnace, to which the Heffian Bellows will be very ufeful. I have already made a little tryal of it, and I had a very ftrong Fire in a Furnace, to melt Glafs, Iron, or any other hard Mettal; and yet I could open the Furnace above the matter to be wrought upon, and yet no Flame would get out through the Aperture; nor cold Air from without get into the Furnace: So that it is very like this will be a great conveniency for feveral forts of Work, fince Men may work the Matters when they are most foftned in the Fire; and they may be drawn up Perpendicularly, that they may not be bent, as they are when we draw them Horizontally. I believe that would be good, efpecially to make eafily Glafs Pipes and Looking glaffes of an extraordinary bignefs. It would be too long to give now the description of these Inventions; and I have made mention of these but by the by, to shew that the Hellian Bellows are an Invention that may be apply'd to feveral good uses, and so that deferve very much to be improved.