A Full Deſcription, with the Uſe, of the new Contrivance for Raiſing-Water, *propounded in the* Phil. Tranſ. N°. 173; *by Dr* Papin, Fellow *of the* R. S.

THere being already ſix Months, ſince I did firſt propound a *new way for raiſing water*, printed ſince in the *Philoſophical Tranſactions* of July 1685; and no body having yet unriddled it, I believe it would be needleſs to conceal it any longer; but will rather, according to my promiſe, give a full deſcription of the whole contrivance; that the *R. S.* may be pleaſed to improve it, and that it may be made uſe of, by thoſe who may have occaſion for it.

Tab. 1. Fig. 4. *AA* is the great Tumbler, that muſt have ſome little hole in the bottom as *I*.

ILL. a ſlender Pipe hidden by the Chimney-Board *BB*, whereby the Tumbler *AA* hath communication with the Pump or bellows *MM*.

MM. ſome kind of Pump or Bellows well ſhut, and having no other aperture, but through the Pipe *ILL*. Theſe are put in ſome ſecret place, where a body may play the ſame and not be ſeen.

NN, a ſlender Pipe, that makes a communication between the glaſs *AA*, and the crown *FF*; this Pipe reacheth near to the cover of the crown, that the water contain'd in it, may not run down by that aperture.

EE the factitious Corall hollow within, ſhut at the bottom, and open at the top.

DDDD two crooked Pipes, ſoddered to the ſides of the Corall *EE*, ſo that the water running down the Corall, may ſpout out through the holes *DD*.

OO a pipe hidden in the Corall *EE*, paſſing through the

the bottom of the ſame, where it muſt be well ſoddered, and reaching near to the bottom of the Rock *G C*.

P P a Pipe to convey the water from the glaſs *G G* into the Rock *C C*; this Pipe is well ſoddered to the cover of the ſayd Rock.

Q a valve working by a ſpring at the bottom of the Pipe *P P*, to keep the water, that gets in that way, from returning back.

R another valve at the top of the Pipe *O O*, that the water, getting up that way, may not fall through the ſame.

Now it is plain, that the Rock *C C*, being fill'd partly with water, and partly with *Air*; if we open the bellows *M M*, the *Air* from the Crown *F F*, muſt run through the Pipe *N N*, into the Tumbler *A A*: and thence through the Pipe *I L L*, into *M M* to fill the vacuity made therein: the *Air* in the Crown *F F* being thus rarified, gives liberty to the *Air* in the Rock *C C* to rarify too, by driving the water through the Pipe *O O*: the water being got up into the Crown *F F*, runs down the Corall *E E*, and through the crooked Pipes *D D D* ſpouts out at their upper apertures, and from the ſhells *H H*, falls upon the Rock *C C*: if we come afterwards to ſhutt the Bellows *M M*, the *Air* got into their vacuity, muſt run back into the Tumblers *A A*, and preſs upon the water at the top of the Rock *C C*: but the *Air* in the ſayd Rock, having been rarified, its ſpring is not ſufficient to reſiſt this preſſure, and ſo the water is forced into the ſayd Rock through the Pipe *P P*: and by thus opening and ſhutting the Bellows *M M*, the water muſt conſtantly circulate by the ways aforeſayd.

As for the uſes, this *way for raiſing water* may be apply'd to, this I do conceive: the glaſſes, being meerly to conceal the ſecret, muſt be left out; and there

may be made ſeverall receptacles above one another to receive the rais'd water, ſo as doth the Crown *FF*: and there ſhould be as many bellows to communicate every one with one receptacle: theſe bellows ſhould be moved by an *Axis*, ſo that when the firſt is open, the ſecond ſhould be ſhut; the third open, the fourth ſhut; and ſo forth alternatively; which may be eaſily done: by this means, the firſt or loweſt receptacle would give the neceſſary ſupply of water to the ſecond, the ſecond to the third, the third to the fourth, &c. till the water would be rais'd to the intended height: ſuch receptacles might eaſily be ſet twelve or fifteen foot above one another, and ſo but few of them might raiſe water to a conſiderable heighth, as well as ordinary *Pumps* do; but this new way would have this advantage, that in the ordinary pumps the ſtrength to be applyed lyeth near the water to be raiſed, but by this contrivance the ſtream of a River may be applyed to draw water out of a mine far diſtant from it: by the ſame way the ſtream of the *Thames* might keep conſtant water works in *Windſor-Caſtle*, as eaſie almoſt as in the loweſt fields: the River *Seine* might do the ſame at S^t^. *Germain*, and perhaps at *Verſailles* too, notwithſtanding the great diſtance: for it is to be obſerved, that the Pipes of communication between the bellows and Engine, being meerly for the conveying of the *Air*, which moves very ſwiftly, they may be ſlender enough, and ſo contain but a ſmall quantity of *Air* to be rarified; and beſides they will not be ſubject to burſt or leak, ſince the preſſure they bear, being all externall to the Pipe, will rather ſtrengthen then break the ſame: from whence it follows, that the ſay'd Pipes need not be ſtrong, but may be made at very ſmall charges. It is alſo to be obſerved, that thoſe bellows, that are open, have the *Air* in them very much rarified, ſo that the outward *Air* lyeth heavy upon (to ſhut) them,

them, by which means the motion of the Engine muſt be helpt in lifting up the oppoſite bellows, that are to be opened: and this obſervation may anſwer the greateſt difficulty that might be objected againſt this contrivance; ſo that I don't queſtion, but this way for raiſing water, may on ſeverall occaſions be of a great advantage.

As a farther Explication of the uſe of this contrivance, ſee Tab. 3. Fig. 2.

AB. AB. Are ſeveral Receptacles ſet above one another, which muſt be well ſhutt and ſoddered every where.

CDD. CDD. Are two ſlender Pipes, whereby the firſt and third receptacles have a communication with the Pump *HH.*

EFF. EFF. Two other ſlender Pipes, whereby the ſecond and fourth receptacles have a communication with the Pump *II.*

HH. II. Two Pumps whoſe plugs are ſo moved by the *Axis LL*, that when one goeth down the other goeth up.

MM. A wheel faſtened to the *Axis LL*, that it may be moved by the Stream of a River.

NO. PQ. NO. PQ. Are big Pipes for the water to to go up, from a lower into a higher receptacle.

O. Q. O. Q. Are Valves fitted to the top of the foreſaid Pipes, that the water may not go down through the ſame.

Now it is plain that when the Plug in the Pump *HH.* is going up, the *Air* comes in through the Pipes *CDD*, and ſo it is rarified in the firſt and third receptacles marked *AA*: and by that means the water may be driven up into the ſaid receptacles through the Pipes *NO.* becauſe at the ſame time the Plug in the Pump *II* going down, cauſeth the *Air* to return to its ordinary preſſure in the ſecond and fourth receptacles, that it may be able to drive up the water through the

the ſaid Pipes *NO*, and the loweſt Pipe draws the water that lyes open to the *Air*. By the ſame reaſon when the Plug in the Pump *II* goeth up, the *Air* muſt come in through the Pipes *EFF*: and ſo it is rarified in the ſecond and fourth receptacles marked *BB*, and by that means the water may be driven up into the ſaid Receptacles through the Pipes *PQ*. *PQ*. becauſe at the ſame time the Plug in the Pump *HH* going down, cauſes the *Air* to return to its ordinary preſſure in the firſt and third receptacles, ſo that it is able to drive up the water through the ſaid Pipes *PQ*.

A Letter from Mr William Cole *of* Briſtol, *to the* Phil. Society *of* Oxford; *containing his Obſervations on the* Purple Fiſh.

GENTLEMEN,

THere being many Naturall things, which I have formerly, and of late, happily found in the South and Weſt parts of *England*, not (as I can find) publiſhed by any *Author*; beſides many more, which have been diſcovered by the induſtrious exquiſitions of divers ingenious and curious Searchers of Nature; (as alſo others which were before thought to be Exotiques;) I have reaſon to believe, that there are very many more (for incouragement of ſuch Inquirers) yet undiſcovered in this our Native Country. Among others, that of the *Purple-Fiſh*, which I found the laſt Winter, on the *Sea* Coaſts

Philosoph. Transact. Numb. 178.

Tab. 3.

Fig. 1.

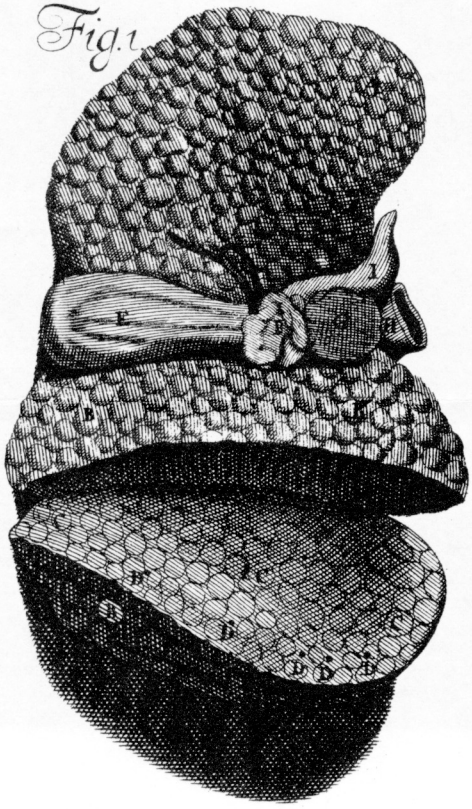

Fig. 2.

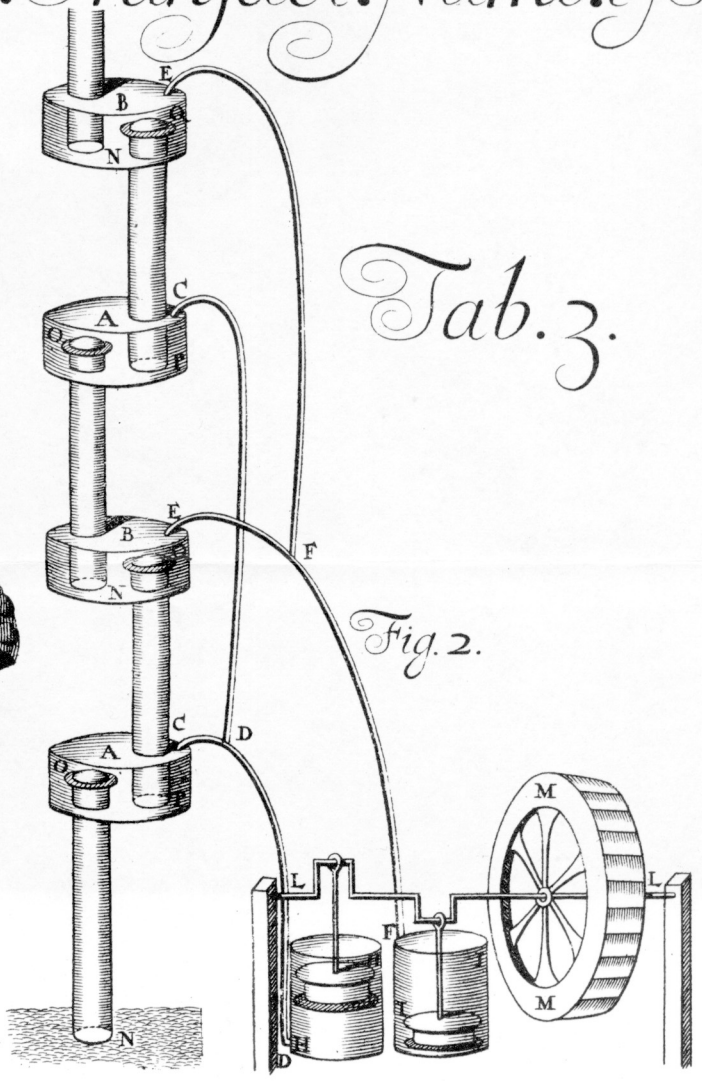

Fig. 3.

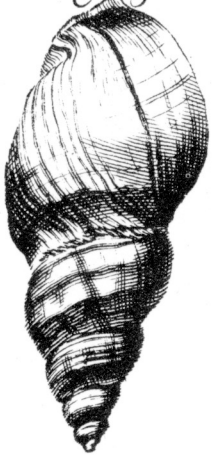

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

MBurgesses sculp.