

342. Sclarea, folio Salviæ, minor, five glabra. T. Inf. 180.
343. Sclarea, folio triangulari; caule tomentoso. Ib.
344. Tribulus terrestris. J. B. 2. 352.
345. Tribulus terrestris, hexaphyllos, Americanus.
An Tribulus terrestris major; flore maximo, odorato. Sloan. Hist. Vol. I. p. 209. Tab. 132. Fig. 1?
346. Trifolium, angustifolium spicatum. J. B. 2. 376.
347. Trifolium arvense, humile, spicatum five Lagopus. C. B. 328. foliis latioribus. *Lagopodium Lagopus. Tab. Icon. 524.*
348. Trifolium, Lagopus dictum, angustioribus foliis. *Lagopus Lob. Icon. 39.*
349. Trifolium pratense, hirsutum, majus; flore albo Sulphureo. Raii Syn. Ed. 2. 193.
350. Trifolium pratense, folliculatum. C. B. 329.

II. *An Examination of Monsieur Perault's new-invented Axis in Peritrochio, said to be entirely void of Friction: With an Experiment to confirm the Reasoning made upon an Axis in Peritrochio first us'd in Mons. Perault's Manner, then in the common Way, by J. T. Desaguliers, L L D.*

AS the Recommendation and Contrivance of a Person, who is considerable in mechanical Performances, is a great Inducement for others to make use of

of a new Machine, which he affirms to have answer'd, in Practice, beyond any other us'd for the same Purpose; so I thought it wou'd be an Advantage to those who have Occasion for Machines, to shew the Imperfection of such an Engine, when the Author of it has been mistaken; thereby to prevent needless Expence and Disappointment, in erecting and trying such kind of Machines.

Monfieur *Perault's* Account of his Engine is as follows: “ In Imitation of the (modern) Crane,
 “ I have invented two Engines for raising Weights.
 “ The first is made of that Organ which is the most advantageous of any in Mechanicks, for facilitating Motion; because it is free from that Inconveniency which we meet with in all others; namely, the Friction of the Parts of the Machine, which renders their Motion more difficult. This Organ is the Roller, which *Aristotle* prefers to all other Organs, because all the others, as Wheels, Capstanes, and Pulleys, must necessarily rub in some of their Parts. But the Difficulty was to apply the Roller to an Engine that raises Weights, its Use having only been hitherto to cause them to roll on an horizontal Plane. The Engine which I propose has a Base A A B, (Plate I. Fig. 1.) something like the Crane: This Base has in its upper Part the horizontal Pieces B, which clasps an upright Shaft C O, supported under its Pivot C, on which the whole Engine moves in the same manner as the Crane, when the Weight is to be lower'd. This Shaft supports on its Top a cross Piece D D, to which are fasten'd the Ropes E E, which wrap round the Barrel, Axel, or Roller F, which has another Rope G, that also wraps or winds
 “ round

“ round one of its Ends. This last Rope is that which
 “ raises the Weight. At the other End of the Axle
 “ there is a great wooden Wheel like a Pully H H,
 “ about which is wound a long Rope N.

“ To work this Engine, one must pull the long Rope
 “ N, which causing the great Wheel to turn, does also
 “ carry round the Axle or Barrel, which is made fast
 “ to it. This Axle, as it turns round, causes the
 “ Ropes E E to wind about it, and thereby the Axle
 “ and the Wheel rise, whilst the Rope F, to which
 “ the Weight is fasten'd, does also wind itself up upon
 “ the Axle the contrary Way; and this double wind-
 “ ing up of the Ropes makes both the Burthen and
 “ the Axle and Wheel to rise at the same Time. Now
 “ it is evident, that all this Rise is perform'd without
 “ the Friction of any Part, and consequently, the whole
 “ Power which draws the Rope N, is employ'd with-
 “ out any Hindrance; which cannot be in other En-
 “ gines.

“ It may be objected that the Power which acts at
 “ N, must, besides the Weight, raise also the Axle and
 “ great Wheel, and that their Weight is one of those
 “ Obstacles which *Aristotle* says all Engines are lia-
 “ ble to; and that this Obstacle is equivalent to the
 “ Friction which is in other Organs. But it may be
 “ answer'd, That Friction is an Obstacle wholly una-
 “ voidable in all other Organs; but that it is easy to
 “ remedy the Obstacles of this, which is done by
 “ Means of the heavy Body M, taken equal in Weight
 “ to the great Wheel and Axle, which it sustains by
 “ Means of the Rope I I, which running over the
 “ Pullies L L, is fix'd to the Ring or Collar K, that
 “ goes round the Axle F. For the Axle and the
 “ Wheel

“ Wheel being counterpois’d by this Weight, the Power
 “ which acts by drawing the long Rope N, acts for
 “ raising the Weight only. The Experiment which
 “ was made with this Engine has confirm’d the Truth
 “ of this Problem, by comparing its Effects with those
 “ of a Crane, in which the Proportion of the Bigness
 “ of the Axle to the Circumference of the Wheel,
 “ was the same as in my Machine : For it happen’d
 “ that in the Crane, a Weight of One hanging at a
 “ Rope going about the Wheel, drew up a Weight of
 “ Seven, when it had one Half added to it to make it
 “ preponderate, or give Motion to the Power : And
 “ when the Weight to be rais’d, and the Weight which
 “ serv’d as a Power, were proportionably encreas’d,
 “ there was also a Necessity to encrease the additional
 “ Weight, which made the Power preponderate, in the
 “ same Proportion : So that as it was requir’d to add
 “ one Half to the Power when the Weight was Seven ;
 “ the Addition to the Power became One for a Four-
 “ teen Pound Weight, Two for a Twenty-eight Pound,
 “ Four for a Fifty-six Pound, and so on ; because
 “ the Resistance from Friction encreases nearly in the
 “ same Proportion that the Weights are encreas’d.
 “ But this did not happen to my Engine, in which one
 “ Quarter was always sufficient for the Draught (or
 “ to make the Power preponderate) not only when
 “ the Weight was Seven, but also when it was Four-
 “ teen Pound, Twenty-eight Pound, Fifty-six Pound,
 “ &c. which evidently shews, that this Engine acts
 “ without Friction.”

Thus far *Mons. Perault*. But however plausible
 this Description may appear, a little Attention will
 shew, that if this new Engine had no Friction, yet it is
 more

more inconvenient than an *Axis in Peritrochio* with the same Proportions; and likewise that it has more Friction than the same Machine in the common Use. A C E, (Fig. 2.) is a common *Axis in Peritrochio*, which has the Wheel A E five Times bigger in Diameter than the Axle; so that A C, the Radius of the Wheel (which is the Distance of the Power) is to C B the Radius of the Axle (the Distance of the Weight) as 5 to 1: Consequently One (for Example one Ounce, as in our Experiment) will keep five in *Æquilibrium*. Now though the Friction of the Gudgeon at C is unavoidable, yet it may be diminish'd by diminishing the Diameter of the Gudgeon, provided it remains strong enough to sustain the Machine and its Burthen. Here one Penny-weight, or $\frac{1}{5}$ of the Power added to it, makes it preponderate, and give the Machine Motion with a due Velocity.

Now this very Engine made use of in *Monf. Perault's Way*, does so alter the Distances of the Weight and Power, that instead of One for our Power, we must have Two and a half to keep the very same Weight Five, in *Æquilibrium*, as may appear by a Sight of the third Figure, where, since in the Action of the Machine, when we pull the Rope P A, we make the Axle D B to wind itself up upon the Rope H D, it is evident that D is now become the Center of Motion, D B (the whole Thickness of the Axis) the Distance of the Weight = 2; and the Distance of the Power is reduc'd to A D = 4. So that if two Men, having been employ'd in the common Way to raise Weights equal to the Strength of ten Men, an Engineer should alter the Manner of working, and fit up the *Axis in Peritrochio* in *Monf. Perault's Way*, instead of gaining an

an Advantage, he must call in three more Men to perform the Work. If it be answer'd, that what is lost in Strength, will be gain'd in Time, it may not only be said, that one cannot always call in more Help on the sudden, but that even then, tho' we should not call this an Inconveniency, yet there will be still more Friction in this than in the common Method; for the Roller or Axle will find a Difficulty to wind on the Ropes, because they are not perfectly pliable, and the less so, the greater the Weight is that stretches them. This, together with the Friction of the Collar of the Rope of the Counterpoise to the Engine, makes the Hindrance greater than in the common Way. For it appears by Experiment, that when the Power is become equal to $2\frac{1}{2}$ to keep the Weight 5 in Æquilibrio, there must be added $\frac{1}{5}$ (here 4 Penny-weight) to put the Power in Motion.

And to shew that this Friction of the Ropes is not always the same as *Monf. Perault* supposes it; when P (or the Power) is made only one Ounce, and W (or the Weight) two Ounces, then to make the Power preponderate, only 2 Penny-weight and 18 Grains was sufficient. N. B. When P is $= 2\frac{1}{2}$, and W = 5, the additional Weight mark'd $\frac{1}{5}$ was 4 Penny-weight and 2 Grains.

It is plain from this, that *Monf. Perault's* Experiments were very inaccurately made, and therefore not to be depended upon.

