quidem prodiret, nullum tamen vulnus infligeretur. Poftero die circa meridiem præter omnem expectationem fupremum fpiritum duxit homo fatis robuftus. Aperto abdomine cadaveris ingens ruptura in inteftino ileo deprehendebatur, ita ut tantummodo a tergo ceteris cohæreret & contenta in cavitatem abdominis effufa ingentem fœtorem naribus afflarent. Hepar pallebat nativo fuo colore prorfus deftitutum, ipfique etiam pulmones a ftatu naturali receflerant, colore naturali amiffo. Ex macula livida abdominis colligebam, faxum angulo acuto impegiffe in ventrem & inteftinum nimia tenfione difruptum fuiffe, quemadmodum incurvata rumpuntur in convexitate fuperiori.

XIII. *An Account of fome new* Statical Experiments, *by* J. T. Defaguliers, *LL. D. F. R. S.*

WHEN a long and heavy Body lying on the Ground is to be rais'd up at one End, (like a Leaver of the fecond Kind) while the other End keeps its Place and becomes the Centre of its Motion; the Prop, that is made ufe of to fupport it at any Point in its whole Length, fuftains a certain Preffure from the Beam. Now the Experiments which I fhall make are to fhew, by a Force drawing always in the Direction of the Prop, what is the Quantity of the Preffure on the Prop, according to the Length of the Prop, the Angle which it makes with the Beam, or with the Horizon, and the Diftance from the Centre of Motion of the Beam at which the Prop is applied. For when the

the Prop is taken away, the Force drawing in the Direction of the Prop will keep the Beam in *Æquilibrio*; and a Force ever so little superior to the Friction added to the Power, will make it overpoise the Beam and raise it higher; but overcome the Power and bring down the Beam, if it be added or applied to the Beam.

Tho' in every Case and Experiment we have this Analogy taken from mechanical Principles, *viz.* that

The Intensity of the Power:
Is to that of the Weight:
As the Distance of the Line of Direction of the Weight:
Is to the Distance of the Line of Direction of the Power,

Yet to find those Distances nicely in the several Applications of the Prop, we must have Recourse to geometrical Constructions and Reasonings. With these and the algebraical Expressions of the same, the Experiments exactly agree.

I design to give to the Society a Paper upon this Subject, wherein will be explain'd not only the Investigation of the Proportion between the Power or Pressure sustain'd by the Prop and the Weight of the Body supported, but also the Determination of the *Maximums* of Pressure, where there are any, and the Nature and organical Descriptions of some particular Kinds of Curves of the third Order, described by one End of the Prop in its successive different Situations.

The Numbers made use of in these Experiments are the result of the Calculations; and all I propose now is to shew the Experiments by Means of a Machine

chine which I contrived for the Purpoſe, and got executed with great Nicety, not in Ornaments, but only where Nicety in a mechanical Inſtrument ought to be obſerved; a Caution uſeful in many other Machines.

In this Machine, the Iron Bar, or Parallelipiped repreſenting the heavy Body, weighs 12 Drams, 12 Dwt, 12 Grains, or 6060 Grains, and its Centre of Gravity is at the Diſtance of 20 Inches and a half from its Centre of Motion.

The Props I make uſe of are, the one of five, and the other of ten Inches. To overcome the Friction, allowed for by certain Rules in all Caſes, I uſe a nice Braſs Pully of three Inches Diameter, whoſe Pivots are but $\frac{15}{1000}$ of an Inch in Diameter; ſo that the 60th part of the Power added to it, will, in all Caſes, overcome the Friction.

First Case.

In which the Prop is perpendicular to the Horizon, exemplified by two Experiments.

Experiment I.

The Prop is equal to five Inches, and plac'd under a Point in the Bar 10 Inches diſtant from the Centre of Motion. Here the Power acting in the Direction of the Prop, able to keep the Bar in that Situation, or the Preſſure ſuſtain'd by the Prop, will be found 250 Ounces, 17 Dwt, 15 Grains; and the Friction 8 Dwt, 15 Grains. The Foot of the Prop is to be at 8 Inches and $\frac{66}{100}$ from the Centre of Motion.

EXPERIMENT II.

If the ſame Prop of five Inches is plac'd under a Point in the Bar at 30 Inches from the Centre of Motion, the Power or Preſſure will be 8 Ounces, 12 Dwt, 13 Grains; and the Friction equal to 2 Dwt, 21 Grains. The Foot of the Prop is to be diſtant from the Centre of Motion 29 Inches $\frac{58}{100}$.

SECOND CASE,

In which the Prop is perpendicular to the Bar, exemplified by three Experiments.

EXPERIMENT I.

Now let the Prop (ſtill five Inches long) be plac'd ſo as to be perpendicular to the Bar in a Point 12 Inches diſtant from the Centre of Motion. Here the Power expreſſive of the Preſſure ſhould be 19 Ounces, 18 Dwt, 4 Grains, and the Friction 6 Dwt, 15 Grains; but on account of a Correction neceſſary to be made to this, (becauſe the Bar is thick as well as heavy, and the Centre of Gravity above the Surface to which the Prop is applied) the Power or Preſſure ſuſtained will be only 19 Ounces, 15 Dwt, 5 Grains, and the Friction 6 Dwt, 14 Grains.

N. B. The Diſtance of the Foot of the Prop in this Caſe is 13 Inches from the Centre.

EXPERIMENT II.

The Prop here is 10 Inches long, (ſtill perpendicular to the Bar) under a Point in the Bar, 24 Inches diſtant from the Centre. The Power equal to the Preſſure ſuſtain'd ſhould be (if the Bar was only heavy, and not thick) 9 Ounces, 19 Dwt, 4 Grains; the Friction 3 Dwt, 11 Grains and an half; but with the proper Correction, which I shall explain hereafter, it must be only 9 Ounces, 17 Dwt, 15 Grains; the Friction 7 Dwt, 7 Grains. Here the Foot of the Prop is to be 26 Inches from the Centre.

EXPERIMENT III.

If the End of the Prop is placed under a Point in the Bar, so that the Horizontal Distance of the Foot of the Prop be exactly equal to the Distance of the Centre of Gravity from the said Centre of Motion, *viz.* 20,5 Inches; the Power or Pressure sustain'd by the Prop will be precisely equal to the Weight of the Bar, *viz.* 12 Ounces, 12 Dwt, 12 Grains. In this Case, the Prop is distant from the Centre of Motion on the Bar 17,9 Inches, and the Friction 4 Dwt, 5 Grains.

The THIRD CASE,

In which the Angle made by the Prop with the horizontal Line is given, either acute or obtuse.

As this Case is very intricate, (on Account of the several Powers of the Sine and Cosine of the given Angle, which are multiplied into the Prop and into the Weight of the Beam) we will exemplify it only in one Experiment; which is, when the Angle made by the Prop, with the horizontal Line contain'd between the Foot of the Prop and the Centre, is acute: then there is a *Maximum* of Pressure, which I will shew by Experiment to be the very same as the Calculation gives. I suppose the Angle made by the Prop and the horizontal Line to be 60 Degrees: The Cal-

Calculation of this *Maximum* ſhews, that if the Prop is 10 Inches long, the Diſtance meaſur'd upon the Bar, to which the upper End of the Prop muſt be applied, will be 10 Inches $\frac{96}{100}$, the Bar itſelf making then an Angle of about 52 Degrees 12 Minutes; and the horizontal Diſtance between the Centre of Motion and the Foot of the Prop is then 11 Inches $\frac{72}{100}$.

N.B. Three Things are to be remarked in this Caſe:

Firſt, That when the Angle made by the Prop and the horizontal Line, contain'd between the Centre of Motion and the Foot of the Prop, is acute, as in the laſt Experiment, there is always a *Maximum:* Whereas if the ſame Angle was obtuſe, there would be no poſitive *Maximum*; for then the Preſſure would continually increaſe, the nearer the Prop is to the Centre of Motion.

Secondly, That when the Angle of the Prop with the Horizon is acute, as in the laſt Experiment, the Bar or long and heavy Body can be raiſed by applying the Power or Prop always with the ſame Angle to the Horizon, quite up to a vertical Situation.

Thirdly, That the firſt Caſe, which is when the Prop is perpendicular to the Horizon, is only a particular Caſe of this more general one.

The Fourth Case,

Is when the Angle made by the Prop with that part of the Beam contain'd between the Point to which it is applied, and the Centre of Motion, is given either acute or obtuſe.

As the Expreſſion of the Power in this Caſe is fully as intricate as in the laſt, I will only give one Example or Experiment; and, for the greater Satisfaction of those that see it, I chose that, wherein the Pressure is in its *Maximum*. I suppose, as before, the Angle made by the Prop, (still 10 Inches long) with that Part of the Beam contain'd between the Point to which it is apply'd, and the Centre of Motion, to be acute and of 60 Degrees; then the *Maximum* of Pressure will be, when the part of the Beam intercepted between the Centre of Motion and the upper End of the Prop is 12 Inches $\frac{21}{100}$; the Bar is then elevated about 50 Degrees 13 Minutes, and the horizontal Distance between the Centre of Motion and the Foot of the Prop is then 11 Inches $\frac{27}{100}$.

N. B. Observe also in this Case as in the last.

First, If the Angle made by the Prop, and the part of the Beam intercepted between the Point of Application and the Centre of Motion, is acute, there will always be a *Maximum*. The contrary will happen, if that Angle is obtuse.

Secondly, If the Angle is acute, the Bar cannot be raised up to a vertical Situation by applying the Power or Prop constantly with the same acute Angle; but it may be raised quite up, if the Angle of the Prop with the Beam is obtuse.

Thirdly, The second Case is but a particular Case of this general one. For the Reasons of all those Things, the Corrections necessary to be made on account of the Thickness of the Bar, the Nature and organical Description of some Curves, and several other remarkable Considerations on this Subject, I must refer to the Paper I shall give in to the Society.