

April 24th 1895

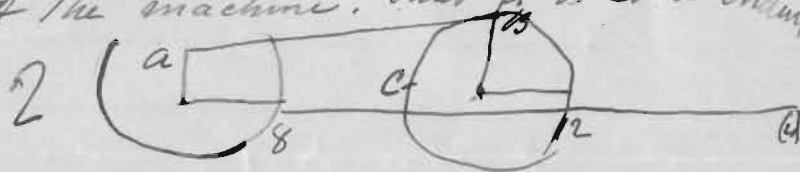
J. Andrews:

First, as to your illustrations of levers supported by "dough" or "heaps of sand," I think they fail as refutations of my theory because they do not fulfil the conditions required to make them similar in principle to it.



If the point 8 retreats, upon a pressure of 8 lbs being applied, but offers in retreating an opposition of 8 lbs, (the moment the pressure is reduced to 7 lbs, for instance) the backward movement being stayed,) & if the point 12 follows the retreating 8, such for such in the same direction, then the lever is for all intents & purposes the same

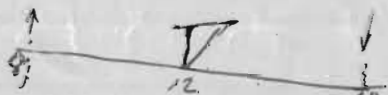
as that drawn above ^{at rest} Considered
 apart from the question, what power
 shall cause these points to move
 uniformly. I can think of
 no objection that can be raised
 to the above statement. - It is
 capable of being practically de-
 monstrated, by holding a ruler
 between the thumb & finger of each
 hand, at the ^{points} positions 8 & 12, &
 then raising both arms simultaneously.
 - It only remains to be shown that
 this illustration is really an illustration
 of the machine. That it is so is evident



from the following considerations,
 It is granted by you that the two
 wheels a & b revolve at the same rate,
 then, for every inch a rises, b must
 also rise an inch, & the bar maintains
 its horizontal position - Now for the
 cause of these motions, &
 the pressure at the different points -

without which the proof that the
 illustration I have made of the ruler,
 is identical with the machine, will
 be incomplete. ^(No 2) If the pressure 12,
 acted at the opposite side of the
 wheel B, at the point C, would
 the effect be the same as though it
 were applied at the point 12? or
 different? Clearly different, The
 pressure would then be acting in
 unison with 8. & the machine
 would find its centre of gravity at
 once, If it is different, then the
 difference can only be owing to
 some opposition at 12 - Now for
 the gist of the whole matter, what
 is the amount of this opposition
 to ascertain this we must find out
 from whence the opposition arises,
^(No 3) Grant an opposition, & a careful
 scrutiny of the figure 2. will not
 reveal any source but the pressure
 upwards at 8, If there is no pressure
 upwards here, then there is no opposition

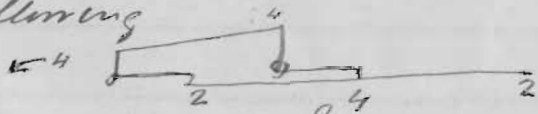
& if there is a pressure upwards, the
 opposition must exist, & cannot
 be got rid of. At argument n^o 2 we
 prove that opposition. At ditto n^o 3
 we show it can be owing to nothing
 but the pressure at 8. Now if
 we see that some part of the 8
 acts, & can find no reason why
 the ^{whole effect of} 8 should be limited, we
 are bound to conclude the whole
 8 acts. Now the 8 owes its existence
 to the 12, & may be destroyed in
 two ways, (1) If the point 12 remains
 stationary, & the point 8 gives way
 through finding no opposition, the pressure
 at 12 will be nil, as in the following
 figure,



or the 8 may be destroyed by the
 12 giving way. Do either of these
 circumstances take place? They do
 not. If we have proved at Argument
 n^o 2 any opposition, can we
 then limit ~~the~~ ^{its} action? & to what?

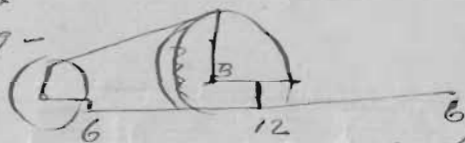
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extent? - We may say that as the
12 depends for its existence upon
finding an opposite at 8, which
opposite being only 6, the 12 is
limited by the same proportion of
itself being subtracted, as 2 is of
8. ^{as one fourth} leaving 9. Then as 8 depends
upon finding an opposite of 12
& finding it but 9, does itself
become 5 - which reacts again
on the 9 limiting it to 6. &
so on infinitum - This is really
the kernel of the whole affair, &
in your objections stripped to their
barest. The argument against
the theory of this is a long one.
Thought out, it amounts to leaving
at last 2 in at 8, & nothing at
12., which is after all what
happens whenever power & resistance
are unequal. The resistance always
nullifying an amount of power.

equal to itself, leaving the difference
 only as available power - It will
 be sufficient to upset this objection
 to consider its effect on the machine.
 This cannot be to allow the point
 12 to drop, for the objection is, that
 if ^{the weight here} it is destroyed, or does not exist, if
 it was unable as 12 to cause a
 fall in the machine towards its
 centre of gravity, do you ask it
 shall be expected to do so when
 it is nothing? - If too, the objection
 is good, that owing to the upward
 pressure at 8, being 2 lbs more
 than sufficient to overcome the
 resistance at 12, that the 12 has
 no opportunity of being called forth,
 & in its failure destroys also the
 8, - What do we make of the
 following



where all the forces are in equilib:
 =ilibrium? Any power sufficient
 to overcome the friction of the parts
 being now ^{at} applied any point other than 2

will cause ~~causing~~ the machine to move independently of the resistance at 2 — — In the following figure $\frac{1}{2}$ the weight of 12 is really cast on the earth, & there is no more resistance to be overcome than 6 is capable of overcoming —



Then if a little more of this weight is thrown away ~~but~~ ^{by} applying it at a point still nearer the axle B than 12, what is to prevent 6 from overcoming it & producing motion?

Your statement that I require the weight 8 to act both upwards & downwards at the same moment, I can only conceive of. By imagining a confusion in your mind of the power & resistance where they meet. In all resistances overcome, there is a pressure downwards of resistance & upwards of power. meeting at the same point, & if these are spoken of indiscriminately as one power, I can see the force of your argument, but not otherwise — Yours