

Insect Strength.

WRITTEN AND ILLUSTRATED BY JAMES SCOTT.



IHAT insects generally are possessed of tremendous strength is a fact which has often been expressed in odd newspaper paragraphs; but I do not remember ever seeing the subject treated pictorially: hence the present illustrated article is offered to the reader.

I intended to utilize three familiar kinds of insects for the purpose of experiment in this connection, viz.: a house-fly, an earwig, and a house-spider; but although I succeeded in harnessing one of the latter species, I hesitated about applying him to any hard work, for the truth is that his waist (which would have been subject to the strain) is so slender that it would probably have broken and divided him into two pieces, and this sort of cruelty I wished to avoid. So I contented myself with the house-fly and the earwig, whose efforts will, I think, astonish the reader.

As a draught animal I did not find the house-fly at all noteworthy—he preferred to use his wings instead of his legs. That these latter appendages are, however, endowed with enormous power may be understood by a reference to the drawings.

I caught a fly who, for a certainty, must have stolen my sugar and other delicacies at some time or other, and, as some recompense for my loss in that direction, I persuaded him to “try his strength.” He was not allowed to do so to his utmost capacity, but to perform what were comparatively easy tests.

My table was strewn with various squares of rather stout blue paper, such as incloses drawing-cards in stationers' shops. Each square differed in dimensions from the remainder, and the scavenger, held by his wings, was permitted to grasp with his claws and pads any piece that he chose. It was a very amusing sight, for when he raised a square

he turned it about in all directions. Of course, he was endeavouring to walk over it, but only succeeded in making the paper travel beneath him, which perhaps pleased him just as well as though his desire had been fulfilled.

The square of paper which tested his strength the most fairly, being neither too easy to manipulate nor too difficult to support without straining his legs, was about twenty-five times larger in area than the length of his own body. Fig. 1 will convey some idea of its comparative size. I calculate that for a man 5ft. in height to equal this feat it would be necessary for him to lift an exceedingly stout and stiff carpet capable of completely covering a room 25ft. (over 8yds.) square. As a matter of fact, the fly lifted the paper by the aid of his feet alone, and did not grasp it by encircling it with his legs. As I before said, he also caused the substance to undergo various evolutions; and whether the feat be regarded as a test of leg strength or a test of the glueing power of the pads which enable him to promenade our ceilings, it still remains a wonderful performance.

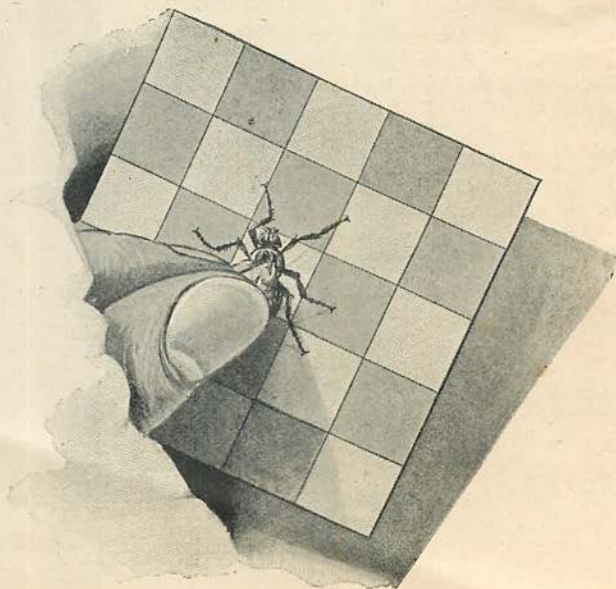


FIG. 1.

Perhaps Fig. 2 will convey a better notion of the fly's strength. It must be remembered that it was an entirely optional matter for the fly to release his hold of the material when he became tired or obstinate, or in the event of the strain on his wing connections becoming at all painful.

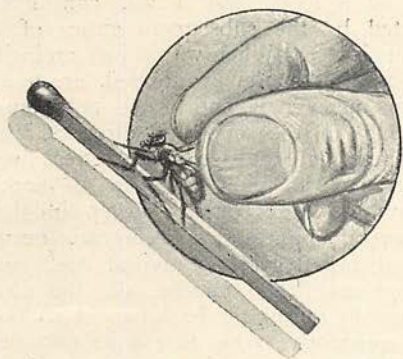


FIG. 2.

He easily lifted an ordinary unused safety match, seven times longer than himself. The fly in the illustration is rather large in proportion to the piece of wood he is supporting; so it will be seen that I have not exaggerated my subject. Comparatively speaking, the match would represent to the average man a balk of timber about 35ft. long, and of a thickness almost identical with that of his own body. He would consider it an abnormal feat of strength, I believe, were he powerful enough to carry a beam conforming to these dimensions under one arm, using the fellow-limb to facilitate the task. Naturally, there cannot be any strictly accurate comparison, on account of the difference in structure between flies and men; but my playful remarks have been substantiated, as well as possible, by very careful observation. I wish to impress upon the reader the fact that the insect could lift two or more matches when they were tied together; but as I desired to show ordinary capabilities, and not Sandowian performances, I depict but one match as being manipulated. The man in Fig. 3 is carrying a length of timber five times that of his own length, to conform to Fig. 2. But it must be remembered that the

match was actually *seven* times longer than the fly.

For the exhibition of the third stage of strength I selected a fresh fly, and after much struggling with the energetic legs I managed to tie a piece of cotton to one of them (Fig. 4). It is necessary to point out, in order to defend myself against possible charges of cruelty, that a fly's limbs are covered with tremendously long bristles, to be compared to pitchfork prongs issuing from a human arm or leg. These prevent a loosely-tied loop from slipping off the leg. A man fastens his collar round his neck much tighter than I attached the "rope" to the fly.

Well, the creature and the cotton, the latter a foot in length, were deposited upon the table. It then put its wings into vigorous action, but quite failed to raise itself. So I cut a portion of the cotton away. Still there was no appreciable upward motion, and I therefore continued to shorten the material. Presently he showed signs of satisfaction, but it was not until the "rope" had been curtailed to a length of about twelve times that of the fly's body that it gracefully soared aloft. The weight was just sufficient to keep the aerial dwarf in sight—an impossible matter under circumstances where the fly has entire freedom of movement.

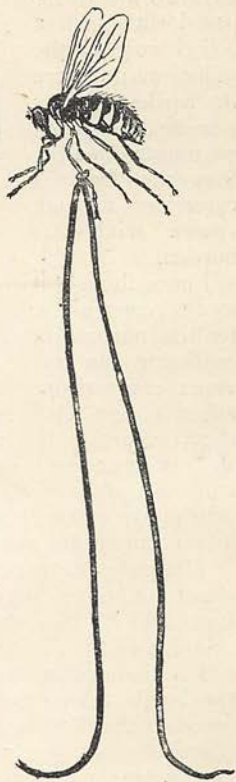


FIG. 4.

Now, in comparison, the cotton would be to a sailor (supposing him to be 5ft. in height) a length of cable much thicker than his thigh, and 60ft. long. I hazard the opinion that he would encounter extreme difficulty in striving merely to lift so immense a coil, without being called upon to fly through the air with it.

I will tell the reader how I arrived at the



FIG. 3.

proper proportion of the coil shown in Fig. 5, in order that he may follow my remarks. The sailor is 5ft. in height. I drew circles within circles according to the following dimensions, dividing the sailor into five pieces :—

One circle was	two-fifths of the sailor,	making	6ft.	circumference
" "	three-fifths	" "	9ft.	" "
" "	four-fifths	" "	12ft.	" "
" "	five-fifths (1)	" "	15ft.	" "
" "	six-fifths ($1\frac{1}{5}$)	" "	18ft.	" "
Total.....			60ft.	

The circles were connected to form a continuous coil. If the weight of the cotton carried be compared with such a coil's weight, the sailor would have the hardest task as a mere lifter; but we must remember that the fly was careering through space with *his* burden.

I have thought it more convenient, for the purpose of rendering the previous comparisons effective, to give them in area; but the weight of the substances concerned is equally surprising. I made a small pair of scales, using as weights little pieces of cardboard, each cut to balance a fly or an earwig as required.

The piece of paper shown in Fig. 1 was about ten times heavier than the fly which supported it; the match weighed four times as much as the fly; and the cotton, half a fly.

For tremendous muscular power, however, the beetle tribe are far in advance of other insects. As I wished my illustrations to be reproduced as nearly life-size as possible, so that a true conception of the experiments would be formed, I selected a few earwigs—blackbeetles were too large. It may form amusing reading to be told of some facts in connection with one of my beasts of burden. I held him down by means of a strip of paper covering his back, the ends being pinned to the table. Then I encircled his horny body with a piece of cotton; but before I could manage to satisfy my desire he had wriggled himself free. Several times I employed this method; and several times I failed to harness him properly. I could not very well hold him in my fingers and secure him to the reins simultaneously; nor could I find

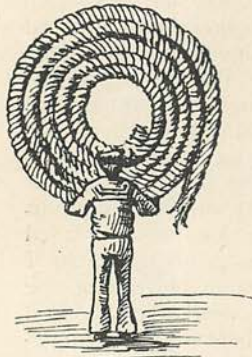


FIG. 5.

anyone possessing sufficient courage to act as a substitute—although it is really abhorrence and not want of nerve which deters people from handling insects. After many vain endeavours I threw the cotton on to the table in despair, and allowed the earwig to do as he liked. It chanced that the cotton fell in the form of a loop, and I was considerably diverted by the subsequent antics of the curious insect. When within half an inch of the cotton it suddenly stopped, erected its nippers menacingly, and turned tail, running hurriedly in the opposite direction, only to repeat its stoppage, and retreat when within half an inch distance of another portion of the cotton. After indulging for several minutes in this eccentric occupation, it began gyrating around itself somewhere near the middle of the loop, continually raising the back half of its body, and apparently trying to nip its own neck. It appeared to be quite frantic, and I have no doubt that it regarded the cotton as a gigantic snake trying to devour it. After feeding it I again strove to harness it, and this time succeeded in doing so. It slowly accustomed itself to the cotton—became “broken-in” as it were; and then I proceeded with the experiments.

I had previously made a cart rim, long and $\frac{3}{4}$ in. wide, formed with a piece of cardboard, having its sides bent down, between which two pieces of lead-pencil (after the lead had been removed therefrom) were pivoted by means of a couple of needles. To this conveyance I attached the farther end of the cotton connected to the earwig, and then patiently awaited the service of the insect. After having fully investigated the peculiar “snake” which encircled it, it showed signs of vigour, and made off at what I suppose must be called a trot, dragging the cart quite easily behind it. Then a match was loaded upon the waggon, making apparently but little difference to the earwig. Matches were successively added until the load comprised an accumulation of eight (Fig. 6). At this point the insect showed signs of a faint struggle, such as a horse does when slipping about the roadway with a somewhat heavy burden.

Although he managed to propel a heavier load than this, it would be equivalent to overwork if he dragged more than eight.

I placed the eight matches upon the scales, and found that their combined weight was twenty-four times that of the insect. Each piece of timber was four

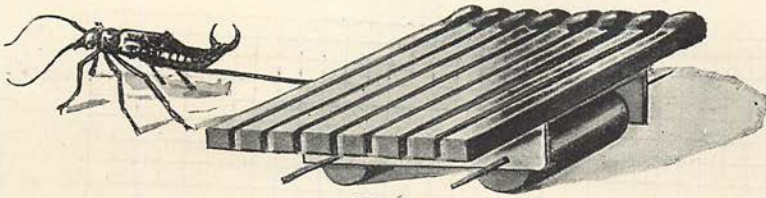


FIG. 6.

times longer than the carrier, making in all a load of wood thirty-two times longer than the earwig. A horse is thicker in depth than breadth; whereas an earwig's breadth exceeds that of its depth. In length (proportionately) there exists little noticeable difference; so that, for the purpose of description, it may be assumed that, except for the difference in the number of legs, a horse corresponds in proportions to an earwig. I have pictorially represented in Fig. 7 a front view of a horse laden with pieces of timber, each of the comparative length of a match. There would be eight of these huge beams;



FIG. 7.

and I think it may be fairly doubted whether an ordinary horse (or even a pair of horses) would be endowed with sufficient strength to enable it to shift the load, without expecting the animal to drag it with tolerable ease.

If the timber were cut up into quarter lengths, to match the width of the cart, an exceedingly long vehicle would be required for its support, and its comparative appearance would resemble that portrayed in Fig. 8. Eight matches were an ordinary load to the untrained earwig, who naturally disfavoured the proceedings, and was not aware, as a horse is, that its toiling was to be followed

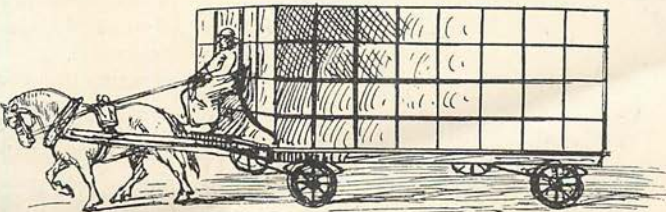


FIG. 8.

by a repast. As for the earwig's extraordinary burden, a glance at Fig. 9 will explain what that means.

I inclined a medium-sized slate by inserting

a pencil between one of its ends and the table, and then let the earwig loose upon it, fettered to the waggon, which he literally "played" with. Then I loaded it with an 1894 penny. "Ah!" I thought, "that will stop you." But, no: being on the down-hill path it managed, with much difficulty I must acknowledge, to drag even that proportionately tremendous burden. In saying



FIG. 9.

that the waggon remained still and did not roll downwards when the earwig stopped, it is implied that the insect was not very advantageously assisted in his work, for the "hill" was not steep enough for the cart to travel along by its own weight. The exact inclination is shown in Fig. 10, wherein a horse is depicted carrying a load of

timber of equal comparative weight. I am enabled to furnish this drawing by having ascertained the number of matches necessary to properly balance an 1894 penny, which I found to be eighty-three. As a match is four times longer than an earwig, we must

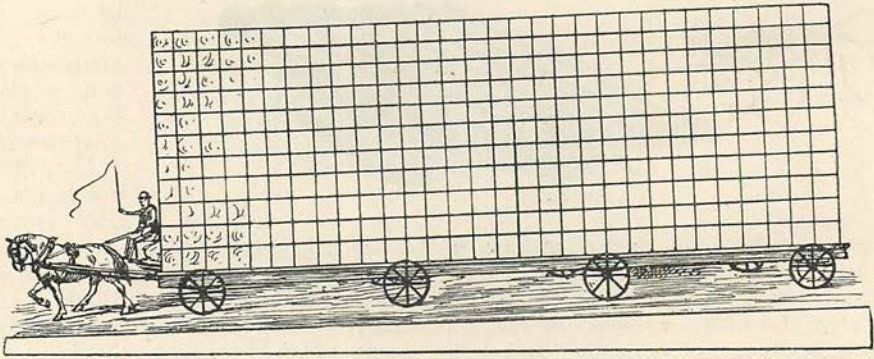


FIG. 10.

divide our timber into lengths equal to that of a horse, which I am supposing to be proportionate in bulk and length, as a member of the larger animal world, to what the earwig is as a creature of the insect world. An easy calculation provides us with the astounding fact that quite 330 (I use round numbers) solid pieces of timber, each as long and thick as himself, will be needed if he were required to carry a proportionate load to that

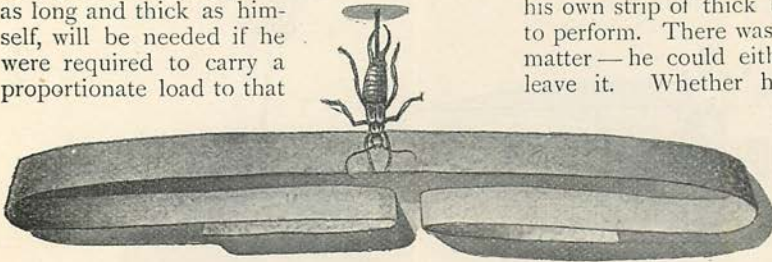


FIG. 11.

carried by the earwig on a sloping roadway resembling, say, Fleet Street.

Another view of the matter is equally surprising, and will serve to give some idea of this exceedingly powerful performance if we remember that one or two horses constitute a load for another horse, as may often be observed in the streets when a knacker's cart passes by. The penny is equal to no fewer than 250 earwigs: therefore, a horse, to exhibit the same power of traction on the same gradient, would need to carry, not two, but 250 other horses in this way.

Hitherto I have supposed both the carts used by the horse and the earwig to be proportionate in weight, but, as a matter

of fact, the earwig should be accorded a more praiseworthy triumph in this direction. The cart of cardboard, having solid wheels of blacklead pencil, weighed *forty-six* times more than himself—a wonderful load in itself.

The last feat which I invited my precious insect to favour me with is shown in Fig. 11. I held him aloft and allowed him to select his own strip of thick blue paper with which to perform. There was no compulsion in the matter—he could either take the paper or leave it. Whether he was proud of his strength, I do not know; but he vigorously tugged at a strip twenty times longer than himself, and quite as broad. Special attention is directed to the fact

that he employed but two feet in the process. Unlike his companion, the house-fly, he refused to gyrate his load, but grimly held it poised in a tenacious grip.

I weighed the paper and found it equal to twelve times his own weight. I have pictorially represented a similar task, weight-for-weight, being accomplished by a man. In Fig. 12 are shown a dozen men being upheld by another. The rope which would be necessary to bind one to another

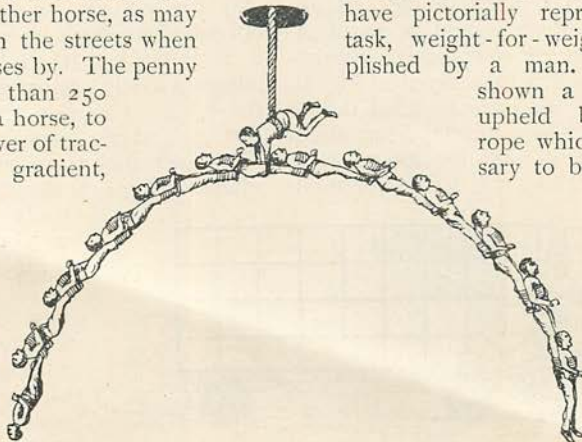


FIG. 12.

for the purpose of so risky (and, of course, impossible) an experiment need not be counted, for the earwig lifted heavier pieces of paper than that referred to.