

spiders' bags. The common webs of spiders are too slight and fragile to be put to any use; but the French experimentalist in question, Monsieur Bon, was led to believe that the cocoons of the female spiders were more solidly built than the mere traps of the ferocious males. Various experiments led M. Bon to adopt the short-legged silk spider as the most productive kind. Of this species he made a large collection. He employed a number of persons to go in search of them; and, as the prisoners were brought to him, one by one, he inclosed them in separate paper cells, in which he pricked holes to admit the air. He kept them in close confinement, and he observed that their imprisonment did not appear to affect their health. None of them, so far as he could observe, sickened for want of exercise; and, as a jailer, he appears to have been indefatigable, occupying himself catching flies, and delivering them over to the tender mercies of his prisoners. After a protracted confinement in these miniature Bastilles, the grim M. Bon opened the doors, and found that the majority of his prisoners had beguiled their time in forming their bags. Spiders exude their threads from papillæ or nipples, placed at the hinder part of their body. The thread, when it leaves them, is a glutinous liquid, which hardens on exposure to the air. It has been found that, by squeezing a spider, and placing the finger against its papillæ, the liquid of which the thread or silk is made may be drawn out to a great length.

M. Reaumur, the rival experimentalist to M. Bon, discovered that the papillæ are formed of an immense number of smaller papillæ, from each of which a minute and distinct thread is spun. He asserted that, with a microscope, he counted as many as seventy distinct fibres proceeding from the papillæ of one spider, and that there were many more threads too minute and numerous to compute. He jumped to a result, however, that is sufficiently astonishing, namely, that a thousand distinct fibres proceed from each papillæ; and there being five large papillæ, that every thread of spider's silk is composed of at least five thousand fibres. In the heat of that enthusiasm, with which the microscope filled speculative minds in the beginning of last century, M. Leuwenhoek ventured to assert that a hundred of the threads of a full-grown spider were not equal to the diameter of one single hair of his beard. This assertion leads to the astounding arithmetical deduction, that if the spider's threads and the philosopher's hair be both round, ten thousand threads are not bigger than such a hair; and, computing the diameter of a thread spun by a young spider as compared with that of an adult spider, four millions of the fibres of a young spider's web do not equal a single hair of M. Leuwenhoek's beard. The enthusiastic experimentalist must have suffered horrible martyrdom under the razor, with such an exaggerated notion of his beard as these calculations must have given him. A clever writer, in Lardner's Cyclopædia

[From Dickens's Household Words.]

#### SPIDER'S SILK.

**U**RGED by the increased demand for the threads which the silk-worm yields, many ingenious men have endeavored to turn the cocoons of other insects to account. In search of new fibres to weave into garments, men have dived to the bottom of the sea, to watch the operations of the pinna and the common mussel. Ingenious experimentalists have endeavored to adapt the threads which hold the mussel firmly to the rock, to the purposes of the loom; and the day will probably arrive when the minute thread of that diminutive insect, known as the money-spinner, will be reeled, thrown, and woven into fabrics fit for Titania and her court.

In the early part of last century, an enthusiastic French gentleman turned his attention to spiders' webs. He discovered that certain spiders not only erected their webs to trap unsuspecting flies, but that the females, when they had laid their eggs, forthwith wove a cocoon, of strong silken threads, about them. These cocoons are known more familiarly as

notices these measurements, and shows that M. Leuwenhoek went far beyond the limits of reality in his calculation.

M. Bon's collection of spiders continued to thrive; and, in due season, he found that the greater number of them had completed their cocoons or bags. He then dislodged the bags from the paper boxes; threw them into warm water, and kept washing them until they were quite free from dirt of any kind. The next process was to make a preparation of soap, saltpetre, and gum-arabic dissolved in water. Into this preparation the bags were thrown, and set to boil over a gentle fire for the space of three hours. When they were taken out and the soap had been rinsed from them, they appeared to be composed of fine, strong, ash-colored silk. Before being carded on fine cards, they were set out for some days to dry thoroughly. The carding, according to M. Bon, was an easy matter; and he affirmed that the threads of the silk he obtained were stronger and finer than those of the silk-worm. M. Reaumur, however, who was dispatched to the scene of M. Bon's investigations by the Royal Academy of Paris, gave a different version of the matter. He found, that whereas the thread of the spider's bag will sustain only thirty-six grains, that of the silkworm will support a weight of two drachms and a half—or four times the weight sustained by the spider-thread. Though M. Bon was certainly an enthusiast on behalf of spiders, M. Reaumur as undoubtedly had a strong predilection in favor of the bombyx; and the result of these contending prejudices was, that M. Bon's investigations were overrated by a few, and utterly disregarded by the majority of his countrymen. He injured himself by rash assertions. He endeavored to make out that spiders were more prolific, and yielded a proportionably larger quantity of silk than silkworms. These assertions were disproved, but in no kindly spirit, by M. Reaumur. To do away with the impression that spiders and their webs were venomous, M. Bon not only asserted, with truth, that their bite was harmless, but he even went so far as to subject his favorite insect to a chemical analysis, and he succeeded in extracting from it a volatile salt which he christened Montpellier drops, and recommended strongly as an efficacious medicine in lethargic states.

M. Bon undoubtedly produced, from the silk of his spiders, a material that readily absorbed all kinds of dyes, and was capable of being worked in any loom. With his carded spider's silk the enthusiastic experimentalist wove gloves and stockings, which he presented to one or two learned societies. To these productions several eminent men took particular exceptions. They discovered that the fineness of the separate threads of the silk detracted from its lustre, and inevitably produced a fabric less refulgent than those woven from the silkworm. M. Reaumur's most conclusive fact against the adoption of spi-

der's silk as an article of manufacture, was deduced from his observations on the combativeness of spiders. He discovered that they had not arrived at that state of civilization when communities find it most to the general advantage to live on terms of mutual amity and confidence; on the contrary, the spider-world, according to M. Reaumur (we are writing of a hundred and forty years ago), was in a continual state of warfare; nay, not a few spiders were habitual cannibals. Having collected about five thousand spiders (enough to scare the most courageous old lady), M. Reaumur shut them up in companies varying in number from fifty to one hundred. On opening the cells, after the lapse of a few days, "what was the horror of our hero," as the graphic novelist writes, "to behold the scene which met his gaze!" Where fifty spiders, happy and full of life, had a short time before existed, only about two bloated insects now remained—they had devoured their fellow spiders! This horrible custom of the spider-world accounts for the small proportion of spiders in comparison to the immense number of eggs which they produce. So formidable a difficulty could only be met by rearing each spider in a separate cage; whether this separation is practicable—that is to say, whether it can be made to repay the trouble it would require—is a matter yet to be decided.

Against M. Bon's treatise on behalf of spider's silk, M. Reaumur urged further objections. He asserted that, when compared with silkworm's silk, spider's silk was deficient both in quality and in quantity. His calculation went to show that the silk of twelve spiders did not more than equal that of one bombyx; and that no less than fifty-five thousand two hundred and ninety-six spiders must be reared to produce one pound of silk. This calculation is now held to be exaggerated; and the spirit of partisanship in which M. Reaumur's report was evidently concocted, favors the supposition that he made the most of any objections he could bring to bear against M. Bon.

M. Bon's experiments are valuable as far as they go; spider's silk may be safely set down as an untried raw material. The objections of M. Reaumur, reasonable in some respects, are not at all conclusive. It is of course undeniable that the silkworm produces a larger quantity of silk than any species of spider; but, on the other hand, the spider's silk may possess certain qualities adapted to particular fabrics, which would justify its cultivation. At the Great Industrial Show, we shall probably find some specimens of spider's silk; such contributions would be useful and suggestive. The idea of brushing down cobwebs to convert them into ball-room stockings, forces upon us the association of two most incongruous ideas; but that this transformation is not impossible, the Royal Society, who are the possessors of some of M. Bon's spider-fabric, can satisfactorily demonstrate.