

## LOCUST FLIGHTS EAST OF THE MISSISSIPPI.

BY PROFESSOR C. V. RILEY.

To the unscientific mind there are few things more difficult of apprehension than that species, whether of plants or animals, should be limited in geographical range to areas not separated from the rest of the country by any very marked barriers or by visible demarcations. Yet it is a fact well known to every naturalist: and the geographical distribution of species forms at once one of the most interesting and one of the most important studies in natural history. Some species have a very limited, others a very wide, range; and while in the course of time—in the lapse of centuries or ages—the limits have altered in the past and will alter in the future, they are, for all practical purposes, permanent in present time. These limits may in fact, for the purpose of illustration, be likened to those which separate different nations. Though frequently divided by purely imaginary lines, the nations of Europe, with their peculiar customs and languages, are well defined. Along the borders where two nations join, there is sometimes more or less commingling; at other times the line of demarkation is abrupt; and in no case could emigrants from the one long perpetuate their peculiarities unchanged in the midst of the other. Yet in the battle of nations the lines have changed, and the map of Europe has often been remodeled. So it is with species. On borders of the areas not abruptly defined, to which species are limited, there is more or less modification from the typical characters and habits; while in the struggle of species for supremacy, the limits may vary in the course of time. The difference is that the boundaries of nations result from human rather than natural agencies, while those of species result mostly from the latter, and are therefore more permanent. I found some difficulty, at the late conference of governors at Omaha to consider the locust problem, in satisfying those present that the Rocky Mountain locust could not permanently thrive south of the 44th parallel or east of the 100th meridian, and that there was no danger of its ever extending so as to do serious damage east of a line drawn a little west of the center of Iowa. They could not see what there was to prevent the pest from overrunning the whole country, and thought that Congress should



ROCKY MOUNTAIN LOCUST.

be appealed to, not alone on behalf of the country that has suffered from its ravages, but also of the whole country that is threatened therefrom. In my last two reports I have discussed the native home of the species, and the conditions which prevent its permanent settlement in the country to which it is not native. Briefly, the species is at home and can come to perfection only in the high and dry regions of the northwest, where the winters are long and cold, and the summers short; and whenever it migrates and oversweeps the country to the south or southeast, in which it is not indigenous, the changed conditions are such that the first generation hatched out in that, to it, unnatural climate either forsakes it on the wing, or perishes from debility, disease, and general deterioration. On the soundness of this conclusion depends the future welfare of most of the more fertile States between the Mississippi and the mountains; and Science, as well as past experience, shows it to be sound. Upon this hypothesis the people, of nearly the whole country so scourged during the year, and so threatened next spring, may console themselves that the evil is but temporary: they may have to fight their tiny foe most desperately next spring, but they have also the assurance that, even if he prove master of the field, he will vacate in time to allow of good crops of some of the staples, and that he may not return again for years. On the other hypothesis, for which there is only apparent and no real reason, ruin stares them inevitably in the face.

The causes which limit the eastward flight of the winged swarms that come from the northwest are, with the majority of people, still more difficult to appreciate, for most persons can see no reason why a swarm that overruns the western portions of Minnesota, Iowa, and Missouri should not extend to the eastern borders of the same States, or into Illinois, Indiana, Ohio, and eastward. Without discussing some of the more occult climatic influences that bear on the belief that they never will, the principal arguments rest in the facts, that: 1. The power of flight of any insect that has a limited winged existence must somewhere find a limit. 2. That all past experience has shown that *caloptenus spretus* has never extended in a general way beyond the limit indicated; and, 3, that, as long as the present average conditions of wind and climate prevail, it is reasonable to suppose it never will.

One of the principal difficulties in the way of a proper apprehension of these facts is found in the failure of the popular mind to properly discriminate between species. The ordinary newspaper writer talks of the grasshopper, or the locust, as though, all over the country and all over the world, there was but one and the same species. One of the governors present at the conference referred to was at first fully of the belief that our Rocky Mountain pest came all the way from Asia. In the case of this destructive species, even some entomologists have added to the difficulty by erroneously claiming that it is common all over the country, to the Atlantic.

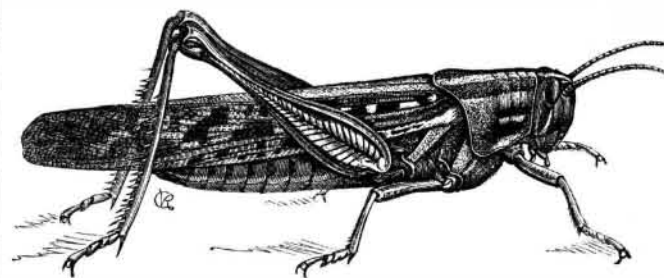
The above thoughts are suggested by the following reports that have just met my eye in the Cincinnati *Gazette* of October 24, from Dayton, Middleton, and Hamilton, respectively: "The advent of Kansas grasshoppers, over Sunday and until Monday evening, in great numbers throughout this city

is a most remarkable incident. They were found early on Sunday morning, and left, as suddenly as they came, on Monday evening."

"A shower of mammoth grasshoppers came down upon our town and vicinity on Saturday night. We have never seen such large ones before, and we understand from old citizens that they are entire strangers in this part of the country. We saw a boy have a string tied to two of them (which were as long as a man's finger) trying to drive them, and he succeeded pretty well."

"A flock of grasshoppers alighted in Hamilton about 11 o'clock on Saturday night, from the northwest. Those that were not drowned in the river, or killed by the heavy rain, were probably gobbled up before Sunday night by the chickens."

Such reports as these very naturally confirm the unscientific in their idea that the locust plague of the West, or so-called "Kansas grasshopper," has overstepped the limits entomology prescribes to it, and is upsetting the conclusions of Science. The same swarm passed over Oxford in the same State, in a southwesterly direction; and fortunately that veteran and well known apiarian, the Rev. L. L. Lantroth, who has not forgotten to be a close observer, had specimens sent to me. They prove to be the American acridium, *acridium Americanum*. As stated in my 8th report, it is our largest and most elegant locust, the prevailing color being dark brown, with a broad, pale yellowish line along the middle of the back when the wings are closed. The rest of the body is marked with deep brown, verging to black, with pale reddish brown, and with whitish, or greenish yellow: the front wings being prettily mottled, the hind wings very faintly greenish with brown veins, and the hind shanks generally coral red with black-tipped, white



AMERICAN ACRIDIMUM.

spines. The species is quite variable in color, size, and marks, and several of the varieties have been described as distinct species by the species grinders. It has a wide range, hibernates in the winged condition, and differs not only in size and habit from the Rocky Mountain locust, but entomologically is as widely separated from it as is a sheep from a cow.

It is a species common over the country every year, and during exceptional years becomes excessively numerous, and acquires the migrating habit, its wings being long and well adapted to flying. It has been very abundant in the present year; and toward the end of July, while in the unfledged condition, did an immense amount of damage to the cotton and other crops of Georgia and South Carolina. The papers were full of graphic accounts of their destruction, and not only editors very generally took it for granted that they had to do with the western *spretus*, but Mr. T. P. Janes, Commissioner of Agriculture for Georgia, in his circular No. 27, supposed they were the same. Specimens which he subsequently sent me, however, revealed at once their true character.

In September, 1875, large swarms of locusts passed over Illinois, and those who were bent on the idea that there was no reason why that State should not be overrun with the Rocky Mountain locust found apparent justification for their views in the said swarms. Yet these proved to be composed of three species\*, indigenous to Illinois and every year common there; and after settling they did no harm, and nothing was heard of their progeny the following spring—all which would have been very different had it been a question of the western *spretus*.

The damage done by some of the more common locusts that occur over the country is sometimes very great, especially during hot dry years. In some of the New England States their ravages have, in restricted localities, fairly equaled those of the voracious *spretus* of the West. But while a few of them, under exceptional circumstances, develop the migratory habit, they none of them ever have compared, and in all probability never will compare, with *caloptenus spretus* in the vastness of its migrations and in its immense power for injury over extensive areas. In economic entomology, discrimination between species is very important, and the lack of it often leads to most erroneous conclusions. Whenever we hear of locust flights east of the Mississippi we may rest satisfied that they are not of our Rocky Mountain pest, and are, comparatively, harmless. Manhattan, Kan.

## Asbestos.—Its History and Uses.

Mr. C. E. Foster has compiled, for the *American Exchange and Review*, the following interesting history of the application of asbestos in the practical arts:

The daily increasing importance of asbestos in connection with packings, bearings for journals, coverings for boilers, and similar purposes, has directed attention to other applications and uses of this material, and to the patents under which exclusive rights to its employment are claimed. Being a natural substance, long known as a possible substitute for animal and vegetable fibers, and its refractory and

\*The differential locust (*caloptenus differentialis*) the Atlantic locust (*caloptenus Atlanticus*) and the red-legged locust (*caloptenus femur rubrum*).

lubricating properties recognized for hundreds of years as its peculiar characteristics, it would seem improbable that any exclusive proprietorship, based on the utilization of these properties, could be claimed or acknowledged at this late day; yet it is by no means uncommon to find advertisements implying the right in some party to the sole use of asbestos for this or that purpose, or to find that capitalists have been induced to invest their money in the experimental manufacture of asbestos products, to be protected under the patent laws.

Asbestos, or amianthus, is a mineral of a white or greenish white color, found in dense heavy blocks. It is capable of being divided into fibers of greater or less fineness and length, resembling hair silk; it is smooth and unctuous to the touch, like plumbago; these qualities are available for lubricating or anti-friction purposes. The mineral is extensively distributed, but much of it is coarse, discolored, or in a disintegrated condition, which renders it unserviceable for any purposes to which asbestos has yet been applied. The finest beds are in Corsica and Italy, but a very fair article is found extensively in Canada, Pennsylvania, Maryland, Virginia, and other places. Efforts to utilize this mineral were early made in the historic period, and one of the first applications was in the manufacture of incombustible fabric. For this purpose vegetable filaments were combined with the mineral fiber, to give strength and consistence during manipulation, the vegetable fiber being burned away after the formation of the fabric. Notwithstanding this fact, the combination of asbestos and animal or vegetable fiber has constituted the basis of many patents, some of which are in existence while others have expired. An English patent, No. 145, for the year 1857, describes a lamp wick of silk and asbestos woven together. Prior patents describe wicks wholly of asbestos; and a latter patent, No. 2,847, for 1865, describes the plaiting of asbestos in a braiding machine, and also felting it or weaving it into ordinary fabric, to be used for lamp wicks. As a fabric, asbestos was once used in the manufacture of shrouds. One of the earliest applications was in the form of paper, and the efforts to render it available for this purpose have been most persevering and unremitting to the present time. An early description of the mode of making asbestos pulp for paper is contained in an English patent, No. 1413, for the year 1853, the process consisting of boiling the mineral, dividing the fibers, and mixing alum therewith. Advantage was early taken of the non-conducting qualities of asbestos in the construction of safes—a reference to its use for this purpose being made in an English patent of 1834, No. 6,555; but it was not until 1870 that it was applied as a non-conductor in refrigerators, when F. Hyatt obtained a United States patent for a refrigerating car. Being flexible, non-combustible, and a natural lubricant, its employment as a packing for pistons and piston rods, joints, and pump plungers naturally resulted. Its adaptation for such purposes is fully set forth in a United States patent for steam engines, obtained by Israel Jennings in 1828. Notwithstanding this fact, several existing United States patents have claims for the use of asbestos for packings and joints, while others claim imparting to it a rope form, for packings, which is clearly described by Jennings. Other patents have been granted for the application of asbestos to journals or bearings, notwithstanding the existence of Jennings' patent, and also of an English patent, No. 2,048, of 1853, for a lubricating combination of asbestos, quicksilver, fats, and oils. A combination of asbestos, soapstone, and cotton is described in P. S. Devlan's patent of August 22, 1865. C. A. Steven's patent of March 29, 1870, claims the insertion of a cord in a rope packing of asbestos to strengthen it; and Morris Botticher's patent of October 4, 1864, refers to the use of the mineral for packing in a loose mass of fiber. A combination of asbestos with plumbago and iron filings is claimed in P. J. Kelly's patent of November 8, 1870; and a combination of asbestos and clay in Lanbureau's English patent, No. 213, for the year 1859, where the mixture is shown molded into bricks or forms for lining fire boxes. Combined with felt or pulp, and made into sheets, asbestos has been for some time applied for roofing, under H. W. Johns' patents of 1868; in 1866 it was applied to carbureters, as specified in J. A. Bassett's patent of September 18. William Beschke patented August 14, 1866, its use in lamps, to absorb the oil and prevent its distribution in case of fracture of the lamp; and the English patent, No. 362, for the year 1865, is based on the insulating property of asbestos, and its use as a non-conducting material in electrical apparatus.

## Railroad Accident.

Recently at North Concord, N. H., two ladies attempted to drive across a railroad track, after the train which had delayed their passage had gone by. They failed to notice a locomotive following closely in the rear of the cars, and consequently were run into and killed. This kind of accident, now becoming altogether too common, is chargeable directly to the negligence of railroad companies, and it will probably continue to occur until railroad crossings at grade are prohibited by law. Experience shows that gatekeepers and signal men, however vigilant, do not prevent people from suddenly driving or stepping upon the track. In England a crossing at grade is a rarity; and in this city, public outcry compelled the sinking of the tracks which pass through Fourth avenue.

SUBSCRIBERS who wish to have their volumes bound can send them to this office. The charge for binding is \$1.50 per volume. The amount should be remitted in advance, and the volumes will be sent as soon as they are bound.