SCIENCE

NEW YORK, JUNE 19, 1891.

LOCUSTS IN ALGERIA.

In his last report on Algerian agriculture, Sir Lambert Playfair remarks on the spread of locusts from the eastern part of the province, to which they had hitherto for the most part confined their ravages, to the central regions. Until the eminent entomologist D'Herculais studied the matter carefully, no specific distinction among the locusts was recognized. He has now shown, according to the London *Times*, that there are two distinct species, belonging to separate genera, each of which has very marked peculiarities. These are the best known of the Biblical species, *Acridium peregrinum*, and the *Strauronotus maroccanus*. Their habits are quite different, the former generally arriving suddenly about April or May, in immense flights, and devastating the green crops. The females penetrate deeply into the moist earth, and deposit their eggs, from eighty to ninety in number, inclosed in a cocoon. Two months afterwards the young locusts or crickets are hatched. They grow rapidly, get their wings in forty-five days, and then continue their career of devastation far in advance.

The other species appear in a winged state in July and August. They also ravage what green exists at that season, and the females deposit their eggs at a much less depth than the others, generally on rocky ground. The cocoons do not contain more than thirty or forty eggs, and they remain without being hatched till the spring of the following year. The first species finds in central Africa the most favorable circumstances for its development; the second, in more temperate countries, such as the Mediterranean region, and even the Caucasus, Crimea, and Asia Minor. It is the latter that has ravaged Algeria during the last few years, but about the middle of December last the arrival of flights of the *Acridium* was reported from several of the oases of the extreme south. Fortunately man is not the only enemy of the locust. Starlings and larks feed eagerly on the eggs. Wagon-loads of these birds used constantly to be sent to the French market, but now the killing of them has been prohibited in the province of Constantine. The larvæ of the *Bombyx cantharis* and other insects also get into the cocoons, and often kill from ten to fifty per cent of the eggs, while minute cryptogamic organisms destroy many more.

The best method of contending against the locust has been very carefully studied. Much has been accomplished by ploughing the ground deeply as soon as possible after the eggs have been laid, so as to bring them to the surface, and thus allow them to become an easy prey to birds and insects. The collection and destruction of the cocoons by manual labor is less sure and more costly, but it has the advantage of affording employment to Arabs, who have been reduced to great misery by the destruction of their crops. The statistics of locusts thus destroyed is startling. It has been calculated that between August and December, 1888, the enormous quantity of 8,000 cubic metres of cocoons were collected and destroyed, and that these contained 200,000,000,000 eggs. After the insects were hatched, 1,200,000,000,000 crickets were killed, and it was the excess beyond these figures that invaded the land.

It is now admitted that the most efficacious means of waging war on the locusts is to concentrate all available resources on the destruction of the young. They remain quite stationary during five or six days after being hatched, and thus time is allowed for their destruction. The Arabs employ very primitive means: they jump among them, treading and crushing them under foot, beating about in every direction with branches of broom and oleander, and lighting immense fires all over the place, with alfa grass, or any dry brushwood that may be available. The most practical method is the use of screens similar to those employed in Cyprus. These are bands of cotton stuff, twenty to twenty-five metres in length, on which are sewn strips of American wax-cloth. The young crickets climb up the former, but when they arrive at the latter they can find no foothold, and tumble back into ditches prepared for their reception, along which sheets of zinc are placed to prevent their egress. As soon as the ditches are filled, the insects are covered over with earth and the screens advanced. During last season the material provided in Algeria, but which was altogether insufficient, was 6,000 screens, each 50 metres long; 100,000 oak pickets; 6,000 steel hammers; 450,000 metres of cord; and 60,000 sheets of zinc.

STEAM-JACKET EFFICIENCY.

In a paper on "Maximum Steam-Jacket Efficiency," contributed to the Journal of the Franklin Institute, Professor Robert H. Thurston says the fact is sufficiently well known that the steam-jacket, as employed on the steam engine, of whatever form and arrangement, is intrinsically a wasteful element, and that its use only gives, in certain cases, an economical advantage by its repression of wastes of larger magnitude. It checks a serious unavoidable waste, more or less completely, by a process which as inevitably involves a waste which is commonly, but, perhaps, not invariably, a lesser one. The ideal steam engine, such as is treated of in the purely thermodynamic study of the steam engine, has a lower efficiency with, than it has without, a jacket. This is readily seen from illustrations computed and checked by Messrs. Hitchcock and Mount, at the suggestion of Professor Thurston, and published in his paper; and it is sufficiently evident, *à priori*, from the consideration that the unjacketed engine receives all its steam at a maximum temperature, expands it adiabatically to a certain terminal temperature, and then exhausts it; while the jacketed receives a part of its heat at intermediate temperatures, expands the fluid non-adiabatically, and finally rejects it at the terminal temperature, with a lower mean range of expansion. In other words, the jacketed engine departs furthest from the principles of economical operations first enunciated by Carnot: "All heat should be received at maximum temperature; expansion should be perfectly adiabatic, and should continue to the minimum temperature and pressure, and all should be rejected as nearly as possible at that minimum." Thus, "theoretically," if the use of that much-abused term may be permitted in this sense, the unjacketed engine is more efficient than the jacketed engine. "Practically," however, the reverse is usually, though probably not always, the case, and the use of the jacket is often found to be productive of a real, and sometimes of large, economy. It is thus obvious that the advantages of the employment of the jacket come of those conditions which distinguish so markedly the real from the ideal case in steam-engine economy; those which make the "theory of the real engine," as the writer has called it, essentially different, in important respects, from the "theory of the ideal engine." In 1886 a "research committee" was appointed by the British Institution of Mechanical Engineers, to investigate the subject of the steam jacket. A very unusually complete set of data, pertaining to trials made with a view to determine the efficiency produced by application of the jacket, was secured. From computations based on these data, performed with great care, the computers checking the figures and the results, there can be no doubt of the existence of a maximum in the value of the steam jacket, the ratios of expansion being varied, and it is probably fairly to be assumed that it may be found in all cases. In the first case, that of the simple non-condensing Corliss engine, the heads unjacketed, the use of the jacket reduced the cylinder wastes from about twenty-five per cent of the ideal consumption of steam and