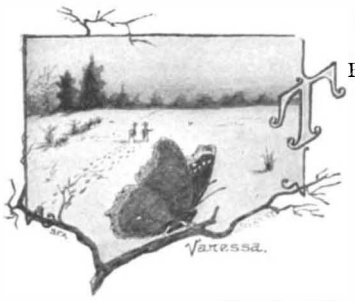


INSECTS IN WINTER.

BY S. FRANK AARON.

THE winter torpidity of insects and of other cold-blooded animals is a subject of considerable interest, about which we know very little. Writers have for the most part taken it up in a general way or have given it little mention. The student becomes at once impressed with the wide difference between torpidity and the hibernation of warm-blooded animals. He finds the latter only a prolonged and more profound sleep, the former a living death which may be quickly thrown off and as quickly resumed with the changes of temperature.

Insects in the preparatory stages—the egg, the larva and the pupa—are entirely immune to cold. They have little or no internal heat to counteract it. The same is true of those in the imago or perfect stage, so long as their sexual functions have not been completed. I have proved by repeated experiments that insects may be subjected to extremely low natural or artificial temperatures, so stiffly frozen that their legs and wings can be snapped off as in the dried specimens; yet after a few minutes' exposure to external heat their vital activity was thoroughly restored.

When, however, my experiments were made with those that had mated and females that had laid their eggs, the attempt to restore them often failed, because such specimens had exhausted their vital forces and would soon have died in any temperature. When a number of ants are artificially frozen and then warmed by external heat, some of them will return to life and activity, while the rest are found to have been killed. The same results follow in experiments on insects of all orders and of all sizes.

When, therefore, insects in the perfect stage seek hidden retreats in which to pass the winter, under loose bark or protecting leaves, or in the crevices of wood, their object is not to find shelter from extreme cold, but from the crushing effects of ice and snow, and especially from the prying search of birds and other enemies. There would be far less chance for these refugees to survive till spring if most of the birds had not migrated southward. But we still have with us during the season of frost and storm the quail and the grouse, scratching for insect food in the loose earth and among the leaves; the woodpecker and the nuthatch, exploring with their sharp bills and sharper eyes the crevices of wood and hiding places under bark; the jay, the chickadee, the purple finch and the winter wren, searching everywhere.

CHRYSALIS OF GRAPTA.

A ray of winter sunshine and a breeze that tempers the frosty air often call forth the long-dormant insects from their snug retreats. When we wander afield on a bright winter day we sometimes see those gay rovers, the Vanessa antiopa butterfly, the Grapta, the Atalanta or the yellow Colias sunning themselves on rocks and logs, or flitting through the leafless woods. Let but a chill wind spring up or a passing cloud obscure the sun, and they vanish as quickly as they came, seeking the nearest friendly shelter. When at last spring fairly returns they are ready for mating, ere long to die when the chief object of their existence has been accomplished.

In houses warmed by wood fires, an occasional stick or log laid near the stove is seen to be swarming with ants which were not visible when the wood box was replenished. These little fellows had been hibernating in crevices of the wood made by the borings of beetle larvæ, and they have now come forth in answer to the genial warmth. House flies, too, are occasionally revived by heat; but generally they perish early in the fall from a white fungus growth peculiar to them, leaving only a few to linger in their familiar haunts during the early winter.

Some of the seemingly feeblest and most perishable forms of insect life surprise the observer by their ability to hibernate and to thaw out quickly under the influence of genial rays. The gnats and midges, those merry dancers in the sunlight, come forth to greet the winter's sun, not only in our milder latitude, but even in the long winters of the far and frozen North.

Centenary of the British Steamship.

Few centenaries are better deserving of commemoration within the United Kingdom than the centenary of steam navigation. And it was just in the close of March, 1802, that the "Charlotte Dundas," the first steamer ever employed for practical purposes, began to tow barges on the Forth and Clyde Canal. Steam vessels had been tried on Dalswinton Loch with success as early as 1788, but they were not intended for use, only for experiment. There were only one or two dreamers, like William Symington, the engineer of the "Charlotte Dundas," and Henry Bell, who built the "Comet" in 1812, who had any idea that steam navigation could ever be turned to practical use.

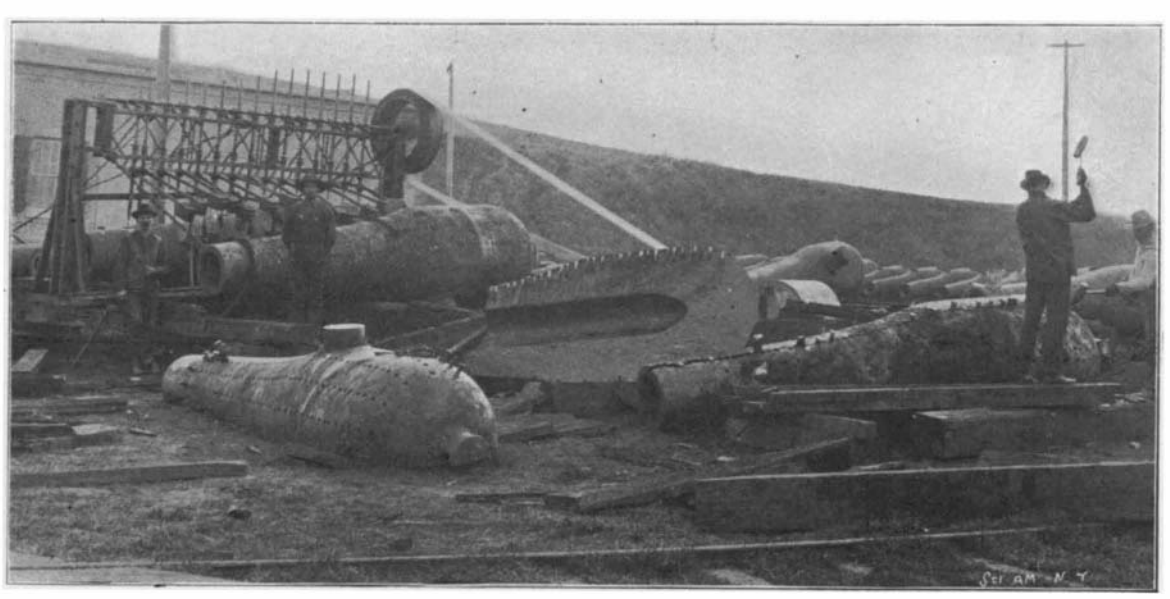
The owners of the Clyde and Forth Canal promptly took steps to stop the running of the "Charlotte Dundas," lest her wash should injure the banks of the canal, and it is even on record that James Watt, the true inventor of the steam engine, threatened William Symington with legal penalties if his engine should prove a success. So the first application of steam to the conveyance of cargo by water ended in financial ruin to the man who had invested his all in it.

WASPS WINTERING UNDER BARK.

The first passenger steamer was not much more successful from a financial point of view than the first steam tug. Henry Bell applied for aid to the government of the day in order that his idea that warships could be driven by steam might be practically tested. It was in 1800, when a steam battleship in the hands of Nelson might have done much. But no help came from the government. Nor did private capitalists think that there was anything to be made by applying steam to the transport of passenger vessels. So Henry Bell struggled on as best he could, and in 1812 the first passenger steamer appeared on the Clyde. She took her name, the "Comet," from the great comet of 1811. She proved that steam navigation was possible for passenger boats, but she ruined her owner, who died impoverished at Helensburgh, on the Clyde, in 1830.

BREAKING UP 15-INCH CAST-IRON GUNS.

A few months ago a considerable number of old cannon were sold at the Mare Island navy yard, the largest being 15-inch, smooth-bore Dahlgrens. They were made of cast iron for use in the civil war. The problem of reducing these guns to fragments of convenient size to be marketed was a difficult one. At last the contractors devised an ingenious scheme. Rows of holes were drilled longitudinally by a gang-drill, as shown in our engraving. The guns were jacked up on roller bearings, so that they could be easily turned to drill the next row of holes. The holes were one inch in diameter and about 7 inches deep; fifteen were drilled at once. After drilling one set of holes, the drill was shifted endwise about 4 inches, and the second set of holes was drilled. The holes were 4 inches apart, and the rows 8 inches apart. A 30 horse power electric motor was used to operate the drill. After drilling, the guns were split open with steel wedges. Two men were able to open one gun in a day. As each gun weighed 42,000 pounds, the problem of reducing it to smaller pieces had also to be met. A barricade was built over the pieces, and under this the segments were broken into small fragments. Sticks of nitroglycerine powder were inserted in the holes and fired. In this way the guns were broken into quite small pieces.



BREAKING UP 15-INCH CAST-IRON GUNS.

GNATS AND MIDGES IN THE SUNSHINE OF A WINTER'S DAY.

Austria's Canal Scheme.

Of exceptional importance is a measure for a new system of canals which has just been adopted in Austria. According to Mr. Carl B. Hurst, United States Consul General at Vienna, "this undertaking will do more than anything yet enacted in Austria to promote the commerce of the country. It will not only bring the various provinces into closer touch, but will also afford the cheapest freight connections with Germany and Russia."

The measure provides, first, for a canal from the Danube to the Oder; second, for a canal from the Danube to the Moldau, near Budweis; third, for a canal from the Danube-Oder canal to the upper Elbe, and fourth, for a canal from the Danube-Oder canal to the Vistula and to some navigable portion of the Dniester. There will be about one thousand miles of navigable waterways, which will be constructed by the State with the co-operation of the provinces, districts and towns, and especially of Vienna and Prague. The contributions of the municipalities and provincial authorities can be made either by single payment or in annual installments, or through the erection of certain works, such as harbors, docks or streets leading to them, or through the cession of land or water rights.

The work of construction will begin at the latest during 1904, and the entire system will be finished within twenty years. The cost of construction, in so far as it will not be covered by contributions, is to be met by an issue of four per cent tax free government bonds, redeemable within ninety years. The government is empowered to issue these bonds to an amount not exceeding $50,750,000 during the period of construction, from the year 1904 to 1912, and the money thus raised shall be used only in building the designated waterways. For the expense after 1912 due provision will be made by law. The entire cost of construction is estimated at $152,150,000, and the canals will be designed to admit boats up to six hundred tons burden.

Only the girls in a telephone exchange in New York city and the officials of the telephone company know what a vast amount of business is transacted in the American metropolis by telephone. In New York and its suburbs about 120,000 telephones are in use, more than in all France. These 120,000 telephones are used in ringing up the central stations about 426,000 times a day.

Electrical Notes.

M. Edward Branly, the well-known French electrician, who has long been interested in the problem of wireless telegraphy, has now perfected a device which it is stated will considerably develop communication by this means. It is called the improved Branly radio-conductor. The Branly coherer is already employed in wireless telegraphy, but the value of the new device is the important discovery that any two pieces of metal, provided one of them be polished or oxidized, will serve all purposes of the tube. Any metal will suffice for this object. The result has even been secured with a common needle. The new radio-conductor consists of a horizontal plaque of polished steel connected with one pole of the circuit, on which rests a small metallic tripod connected with the other pole, the three points of the tripod being oxidized.

An ingenious electric switch for crossovers of road surface railroads has been devised by Messrs. S. Dixon & Sons, electrical engineers of Leeds, England. The feature of the invention is the simultaneous automatic adjustment of crossovers on the rails and overhead wires of an electric system, the object being achieved by means of a small switch conveniently placed in front of the driver of the car. The switch is connected by ordinary electric wires with the trolley head, and is so arranged that when passing a convenient position in front of the crossovers to be moved, by merely turning the switch the points on both rails and the trolley wire overhead are opened, while a second contact after passing the crossover closes them. The necessary batteries for the circuit are inclosed in a box beside the track. The contrivance, which is extremely simple in mechanism, is also fitted with a hand lever, which in case of any breakdown in the electrical equipment can be used to set the crossovers and overhead switch by one movement. The cost of the equipment is about $500 for each set of crossovers.

A comprehensive idea of the remarkable developments of electrical traction in England, especially in London during the past two or three years, may be gathered from the fact that whereas last year Parliamentary powers were sought for an expenditure of $200,000,000 on tramways in the United Kingdom, this year the capital required for the proposed tubes, trams, and trains in London alone represents an outlay of not less than $250,000,000. The possibilities of electric surface railroads in the English metropolis may be gathered from the fact that the London United Tramways, with 16 miles only in operation, carried in twelve months 35,000,000 passengers; while in the same districts in which this street railroad is in operation, there are now under construction 42 miles, and new extensions are proposed of 15 miles, making a total, with tubes and light railways, of 94½ miles. Hitherto one of the greatest obstacles to electric progress in Great Britain has been the discouragement presented on the one hand to scientific and manufacturing skill, and on the other hand to financial enterprise, by illogical legislation. This prejudice against electric traction, however, has now been overcome, and Parliament is seeking to encourage its development as a solution of the problem of housing the working classes, by affording rapid transit facilities between the city and the suburbs. At the present time the capital invested in Great Britain in electric light, power and traction is $4.30 per head of the population, in Germany it is $2.50, and in France $1.64.

For some time past pressure has been brought upon the English government for the establishment of direct telephonic communication between London and Brussels, similar to that already existing between London and Paris, but it has hitherto proved unavailing, since the distance was considered too great between the English and Belgian coasts for laying a submarine telephone cable. Now, however, all difficulties in this direction have been surmounted, and a cable is being manufactured for spanning the North Sea. The work is being carried out for the British postal department, who are working in conjunction with the Belgian government. It is anticipated that the laying of the cable will occupy about six weeks, if the weather is propitious. The cable, which will be the longest submarine telephone cable in existence, will run from St. Margaret's Bay, near Dover, to La Panne, a point near Ostend, fifty-six miles distant. At Brussels, by means of the exchange, facilities will be made for a person in London to ring up a correspondent in any town in Belgium with the ease with which it is now possible to talk between the English and French capitals. Except on rare occasions, when there is heavy weather in the Channel or through some other cause of defect, persons talking over the wire between London and Paris can hear one another as distinctly as if they were in one room together, and the authorities state that there is no reason why it should not be the same in the case of Antwerp and Brussels. Should this attempt prove successful, preparations will be made for connecting London with other European cities by telephone.

AN ACETYLENE WIRELESS TELEPHONE APPARATUS.

The accompanying illustrations represent a new apparatus for the making of experiments in light-telephony. In all such apparatus selenium is used, which possesses the remarkable property of varying in electrical conductivity with the amount of light to which it is exposed.

Fig. 1 represents the transmitting apparatus, consisting essentially of a gas-flame manometer, *m*, by means of which the rays of an acetylene light, *f*, concentrated by the condensing-lens, *l*, may be varied in intensity. These differences of light intensity, which correspond exactly to those of the sound-waves of the human voice, transmitted through the speaking-tube, *s*, are sufficiently pronounced to influence the conductivity of a selenium cell, included in the circuit of a telephone receiver, which reproduces the sounds of the

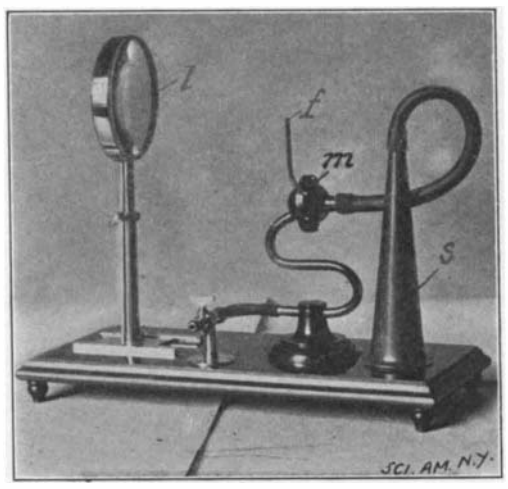


Fig. 1.—THE TRANSMITTER.

voice. In other words, as the light varies with the acoustic waves, the selenium cell is so affected as to cause the current flowing through its circuit to fluctuate, thus giving rise to vibrations of the diaphragm of the telephone receiver, which in turn produce acoustic vibrations.

In order to reproduce the sounds transmitted by the speaking light, the receiving apparatus shown in Fig. 2 is used. The vital part of this apparatus is a concave mirror of German silver; a selenium cell, *S;* a battery, *B;* a polarized relay, *R;* a signal-bell, *G;* and two telephone-receivers, *T*.

In experimenting with these two pieces of apparatus, the transmitter is so placed that the parallel pencils of light emerging from the condensing-lens are caused to fall upon the concave mirror of the receiver. Since the selenium cell, *S*, is mounted in the focus of this mirror, it will be influenced in the manner we have described. The relay will, therefore, be energized and

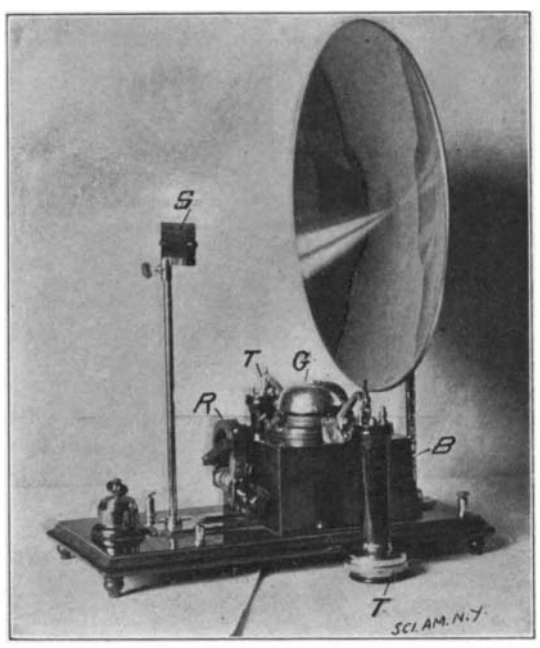


Fig. 2.—THE RECEIVER.

will influence the circuit of the bell, *G*, thereby giving a signal. The bell will ring only during the period in which the rays from the condensing lens fall upon the concave mirror, and will cease its ringing when the telephone receiver is removed from its hook, which occurs because a contact spring cuts out the bell and closes the telephone circuit. Every word that is spoken into the tube, *s*, of the transmitting apparatus can now be distinctly heard in the telephone-receiver. When the receivers are hung up, the transmitter is ready to send another message.

This set of apparatus is particularly well adapted for the demonstration of selenium telephony, whenever it is impossible to employ the Simon speaking-arc light. We are indebted to Messrs. Clausen & Von Bronk, Berlin, for our information.

Pets That Have Become Pests.

The farmers in the vicinity of Wilkesbarre, Pa., have reason to regret their kindheartedness. During the winter—which is said to have been colder even than the proverbial one which the old resident tells about—many sparrows and crows were either frozen or starved to death. Moved by this sad condition, many farmers fed the birds in the morning and evening. This charity, begun by a few, soon spread, until it became the fashion throughout the farming region to feed the birds. During the winter the promiscuous feeding of half-starved birds was a source of delight to children. Now there is a different tale to tell. So accustomed have the birds grown to the daily meals, free from all searching on their part, that they now fill the farmyards seeking food. Open barns are invaded, and wheat disappears in large quantities. The birds perch on the clotheslines on washing day, walk into the houses, and are now so tame that attempts to drive them away are not seriously taken. When spring planting begins more trouble may be expected. It looks as if some slaughter of the birds may be necessary.

Peculiar Currency.

The currency of Abyssinia is somewhat varied, to judge by an account given of it by Count Gleichen in his story of the mission to Menelik, and reprinted by Popular Science Monthly.

For standard money the people of Abyssinia use the Maria Theresa 1780 dollars, but for small change a very different coin is resorted to. This is no other than a bar of hard crystallized salt, about ten inches long and two and a half broad and thick, slightly tapering toward the end. Five of these bars go for a dollar at the capital.

People are very particular about the standard of fineness of the currency. If it does not ring like metal when struck with the finger-nail, or if it is cracked or chipped, they will not take it. It is a token of affection when friends meet to give each other a lick of their respective amolis, and in this way the value of the bar is decreased.

A New Comet.

Dr. William R. Brooks, Director of Smith Observatory and Professor of Astronomy at Hobart College, has discovered a new comet. The position of the comet at the time of discovery was right ascension, 22 h. 55 m. 40 s.; declination north, 29 deg. 12 min. From a telegram received at the Harvard College Observatory, a later observation gives the position, right ascension 23 h. 8 m. 10 s.; declination north, 27 deg. 25 min.; hence it follows that the comet has a daily motion in right ascension of +12 minutes, and in declination —2 degrees. The direction is southeasterly toward the sun. Amateur astronomers will find this comet in the northwest corner of the great square of Pegasus, traveling diagonally across the constellation. The Harvard description states that the comet is "brightish, with tail." Prof. Brooks now has a record of having discovered twenty-three comets.

The Current Supplement.

The leading article in the current Supplement, No. 1373, is an interesting description of a new Canadian iron and steel plant, which is illustrated by six half-tone engravings and which describes the most improved modern method of making steel. Airships just now are very much in evidence; for that reason an article by Mr. Stuart-Bruce on war-balloons, is timely. The automobile section of the Supplement is represented by an illustrated description of the recent Leipsic automobile show, as well as by a discussion of alcohol as a motive agent. Carroll D. Wright, who is probably the foremost American statistician, describes the working of the Department of Labor. Randolph I. Geare concludes his interesting illustrated serial article, "From Raft to Steamship," with a description of modern steam navigation. The consular notes and selected formulæ will be found in their usual places.

Santos-Dumont and Edison.

One of the first visits of Santos-Dumont was paid to Thomas A. Edison, at his Orange laboratory. According to the daily press, the chief topic discussed was the provision of a light motor for the young Brazilian's airship. Edison is said to have remarked that he never gave his attention to the airship, for the reason that it seemed to him of no commercial practicability as yet, and that he concerned himself only with inventions of commercial promise.

A Record-Breaking Week for the Patent Office.

The Official Gazette for April 29 breaks all records for the number of patents illustrated and claimed. The record has been held up to the present time by the issue of the Gazette for April 29, 1890, in which the number of patents shown was 618. By a singular coincidence, both of these remarkable issues bear the same monthly date. The new record is 700 patents.