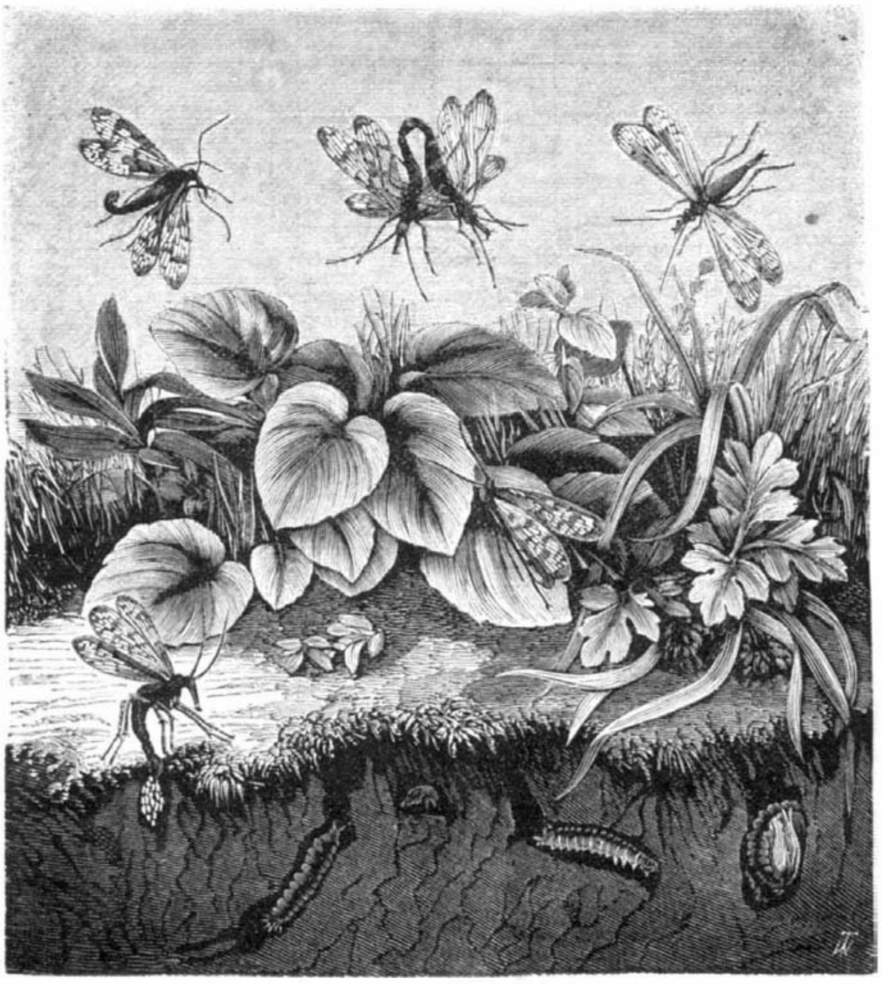
THE SCORPION FLY.

The return of warm weather and the awakening of the insect world are usually simultaneous; and our farmers and gardeners are on the alert, ready for battle against their puny but powerful enemies. The enormous fecundity of insects is, however, somewhat offset by the great appetite for mutual destruction which characterizes many species; and some of the most pestiferous of them are useful, as they frequently destroy myriads of creatures against which human ingenuity can avail little. The scorpion fly, which we herewith illustrate, while in its larval state burrows under the surface of the earth, and is supposed, with apparent reason, to prey on the roots of plants: but no sooner does it develope into a fly than it becomes carnivorous, rapaciously devouring any live insect that it can catch. Its appearance reminds us of the dragon fly; and although it is not so murderous as that celebrated marauder, it does good by destroying the leaf-rolling caterpillars which destroy the foliage (and the vitality) of so many currant and gooseberry bushes, depositing their eggs in the curled-up leaves, and so enabling their offspring to defy hellebore, salt, and other foes to their peace.

History carries back the name of scorpion fly to the days of Aristotle, who fancied these insects were winged scorpions of diminutive size. The joints of the abdomen do suggest a comparison between the two. Other observers have seen a resemblance between the shape of the head (in one species at least) and that of the horse. We miss the brilliancy and lustrous beauty of the eyes so observable in the dragon flies; but yet these organs are keen enough in the scorpion fly tribe. The wings are gauzy, as in the dragon flies, and spotted with shades of gray and brown, while the forceps at the tail of the male fly indicates another resemblance; this is said to have strength to pierce the human skin, but we incline to doubt this. The females, unlike the dragon flies, have an ovipositor or egg placer, rendered necessary by the mode in which the eggs are deposited; otherwise they are equipped as are their partners, and they subsist in the same manner. The legs of these insects, to which allusion has already been made, are well worth looking at under a moderate magnifying power, as they are surrounded with finely cut spines arranged in rings; while the knee joints are fringed and spurred, and the extremity of the foot bears toothed claws, which have been compared to those with which some spiders are furnished.

The larvæ of the scorpion flies are cylindrical in shape, studded with tubercles, and with short fore legs; the head, somewhat flattened, facilitates the burrowing operations that are essential in their mode of life. Having reached maturity, each one scoops out for itself a cell, and there becomes a singularly squat pupa, exhibiting not much resemblance to the perfect insect that is to appear from it. It should be noticed that, if one of these flies is laid hold of, it executes such contortions that some persons are alarmed and speedily let it go.



METAMORPHOSES OF THE SCORPION FLY.

THE DEATH'S HEAD MOTH.

Among the *lepidoptera*, an order which includes the butterflies and moths, the tribe of *sphingina* is in many ways remarkable. Its specific title is derived from sphinx, and is attributable to a habit of the larvæ, of sitting with the head and fore-part of the body raised, in some resemblance to the well known recumbent images of ancient Egypt. The hawk moth is one of the largest species of this order.

Another and well known member of the tribe is the death's head moth, dark brown in color, variegated with yellow, which has on the back of the thorax a deep orange mark, bearing considerable resemblance in shape to a human skull. This was once regarded as ominous, and the appearance of many of the moths was taken for a warning of an approaching pestilence. The omen is certainly portentous, but only to the potatoes, the larvæ being very fond of the plant; and the pupæ are frequently turned up in digging potato grounds. The moths are very fond of honey, and will invade beehives to obtain it: yet the bees are not known to attack them, being apparently scared by the intruders, who emit plaintive squeaks when any one tries to interfere with their proceedings. Our engraving gives an accurate representation of this singular caterpillar, which has always been an interesting study to naturalists, and is evidently not unimportant to agriculturists and gardeners.

LARVA OF THE DEATH'S HEAD MOTH.

The Snapper Telegraph Sounder.

A little instrument is sold in the streets of New York city for 25 cents, for facilitating instruction and practice in telegraph manipulation. It consists of a little strip of ribbon steel mounted at one end in a soft metal block, indented in the middle by a hammer and punch, and fitted at the other end with a brass tip. By pressing down the spring a distinct snapping sound is produced, which is repeated when the spring is allowed to resume its normal position. With the aid of this instrument—which is sufficiently portable to be carried in the waistcoat pocket—conversation can be carried on between persons initiated in the use of the Morse sounder.

Tyre Rolls.

M. Dallar, an engineer of Dusseldorf, has made a new arrangement for rolling tyres. The rolls are on vertical axes. The smooth faced roll, which corresponds with the inner face of the tyre, is mounted on a vertical arbor, which receives its movement through bevel wheels from a horizontal main arbor turned by a twin steam engine, of which the following are the principal dimensions, etc.: Diameter of cylinder, 10 inches; stroke, 36 inches; steam pressure, 8 lbs.; revolutions per minute, 70. The profile rolls are three in number, the first reducing the tyre after it has been forged under the steam hammer, and the two others completing the work. An arrangement like that adopted in lathes allows of giving two distinct movements to the three rolls, a longitudinal movement to bring the roll up against the tyre, and a transverse movement to bring each of the three in succession into action. The last movement is made by hand with the aid of a screw to which a wheel is attached, the transverse carriage bearing the three rolls being thus made to slide on the great carriage which has the longitudinal movement. This latter is mounted somewhat after the fashion of a slide rest on the lathe beds, and its movement is effected by hydraulic pressure brought to bear upon two pistons fixed to the carriages which enter cylinders fixed to the bed. One piston and cylinder, much larger than the other pair, serve to bring up the roll and press it against the tyre, while the smaller piston and cylinder are powerful enough to withdraw it. When the roll is not working, the carriage may be moved by means of a rack and pinion worked by hand. The apparatus is completed by two pulleys turned so as to serve as guides to the tyre, and the position of which is regulated by a hand wheel and screw.

When large tyres are to be rolled, the number of these guide wheels is increased. A horizontal roll also supports the tyre. The apparatus is said to do its work perfectly.

The Royal Society Soiree.

The recent annual soirée of the President of the Royal Society was very brilliant and successful. The Royal Society's apartments consist of five noble rooms on the upper floor and two on the ground, and in each a sufficiency of novelties were displayed. In the first were some models, interest in which was at once excited by their simple labels. One of them was a model of Valour's pile driving machine, used in the construction of the old Westminster Bridge, which was built in 1739 and following years; the other was the original machine, constructed by Heathcote in 1808, which had the effect of reducing the price of bobbin net lace from five guineas a yard to five pence; *apropos* of which a quotation from Lord Bacon was given on the card: "For upon every invention of value we erect a statue to the inventor, and give him a liberal and honorable reward." In this room two of the prettiest and most instructive experiments were shown by Professor Barrett, namely, the lengthening of a bar of soft iron within a helix of wire by heat; the other the remarkable and anomalous changes which take place in the heating and cooling of iron wire. Thus, while the iron is first heating there is a sudden contraction or cooling. And so again, when the heat is cut off, the wire cools a little, and then suddenly reheats and glows, afterwards quietly passing down to a blackness. Now, the notable points of these jerks or changes are that the iron, in the first instance, loses its magnetism, and in the last jerk or oscillation regains it. In the second room some simple delicate radiometers were shown by Mr. Crookes. These consisted of a glass stem supporting a little four-bladed windmill, carrying four disks, one on each end of the four slender glass rays. These work horizontally, supported by a steel point on a small topaz, and the radiation of light from a common candle at some distance away suffices to make them rotate with great liveliness, in vacuo in a small glass globe. In the fourth room was a working model of Sir David Salomons' system of automatic railway signaling. Each engine is supposed to carry a battery and electric bell, and beneath it two metal wheels, insulated from each other, and pressing down on a signal line of small rails laid on the center of the sleepers. These central signal lines are double, and are laid in block lengths, one being a front signal line, the other a back signal line. On arriving at the termination of one block and the commencement of the next, one wheel will roll on the front signal line, while the other will roll on the back signal line, but at other places the left hand wheel will be free. Now one wire of the battery and one from the bell are taken to earth by being simply attached to the engine, the current passing through the ordinary rails of the permanent way. If, then, while a train was on one of the blocks, another train came on the same block, the bell on the engine of the following train would ring—a sufficient warning to stop and avoid danger. In the principal library, on the table beside the model of the fine telegraph ship Faraday, Mr. Siemens exhibited some large fragments of rock which had been dredged up in 1,400 fathoms, from the ocean depths, in the laying of the United States cable. Sir William Thomson's tide-calculating machines, in the same apartment, however, bore the palm of the exhibition. By means of the first one, observation of the rise and fall of the tide is made daily from the shore, and the facts so accumulated are the constants, and form the basis for setting the second or calculating machine, in which a continuous wire passes over a series of wheels placed at various distances, the result being that of harmonic motion of different periods and epochs, by which the year's facts can be ground out by turning a hand wheel, and recorded on the paper-carrying drum.

Novel Steam Launch.

During the last few days some interesting experiments have been made with a steam launch belonging to Sir Gilbert Clayton East. The boat itself is not new, having been built some four years ago by Messrs. Forrest, of Limehouse, and then fitted with engines for driving twin screws by Messrs. John Penn & Sons, the eminent marine engineers of Greenwich. Her owner, however, finding that the two propellers were constantly becoming entangled with weeds, applied a short time ago to Messrs. Penn to supply him with a new engine to drive a single screw, as less liable to that inconvenience. In order to make more cabin accommodation Sir Gilbert East gave directions that the engines should be fitted very far back in the stern—so far back, indeed, as to render the application of an ordinary launch engine impossible—and at the suggestion of Messrs. Penn he decided to make use of a new engine recently patented by Mr. P. W. Willans (a gentleman connected with Messrs. Penn's factory), which could be easily placed in the limited space in the stern. The work connected with the fitting of this engine on board the boat has just been completed.

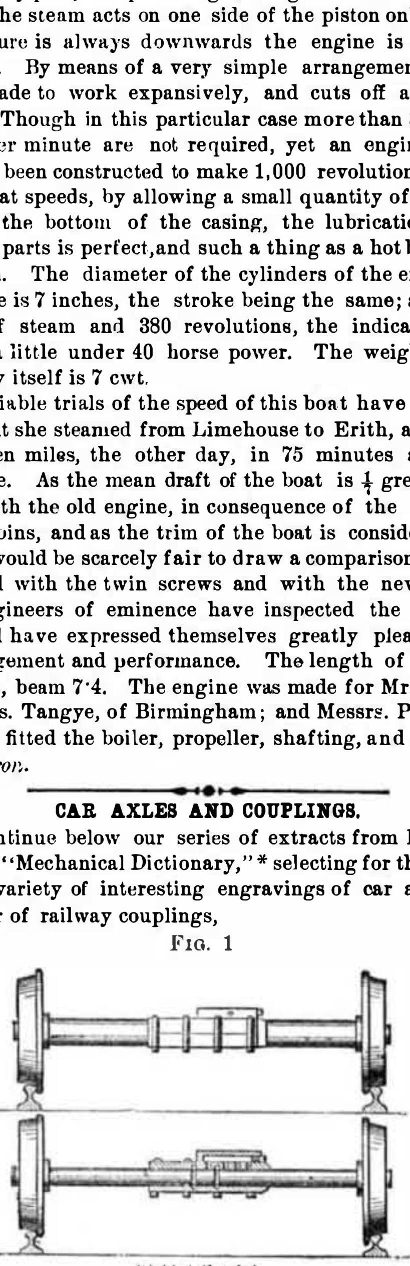
Mr. Willans' engine is constructed with three cylinders, and the only working parts are three pistons, three connecting rods, and a three-throw crank axle; these are enclosed in a cast iron casing, so that nothing can be seen of the engine itself except the two ends of the axle which appear through the casing. The cylinders are placed side by side; and it is by a system of ports which connect the cylinders one with the other, together with a peculiar construction of piston, that the piston of one cylinder acts as the slide, and admits to the next or third cylinder. All these ports meet in a three-way cock, and by turning this cock the direction of the steam is altered, and the engine is stopped or reversed with marvelous rapidity. It will thus be seen that all slides, eccentrics, link motion, and other complicated reversing gear are done away with; there is no exposed machinery to catch the dresses of people passing, no oil and grease flying about, and none of the other disadvantages which make steam engines in small boats so disagreeable. Besides this, the engine is so simple that it is completely under the control of any one, and is so compact that it can be lifted in or out of the boat by two men; two men can also take it to pieces, examine every part, and put it together again in less than an hour. The steam acts on one side of the piston only, and as the pressure is always downwards the engine is perfectly noiseless. By means of a very simple arrangement the engine is made to work expansively, and cuts off at $\frac{5}{8}$ of its stroke. Though in this particular case more than 380 revolutions per minute are not required, yet an engine of the kind has been constructed to make 1,000 revolutions; and at these great speeds, by allowing a small quantity of oil to remain in the bottom of the casing, the lubrication of the working parts is perfect, and such a thing as a hot bearing is unknown. The diameter of the cylinders of the engine under notice is 7 inches, the stroke being the same; and with 90 lbs. of steam and 380 revolutions, the indicator cards showed a little under 40 horse power. The weight of the engine by itself is 7 cwt.

No reliable trials of the speed of this boat have yet been made, but she steamed from Limehouse to Erith, a distance of thirteen miles, the other day, in 75 minutes against a slack tide. As the mean draft of the boat is $\frac{1}{7}$ greater than it was with the old engine, in consequence of the additions to the cabins, and as the trim of the boat is considerably altered, it would be scarcely fair to draw a comparison between the speed with the twin screws and with the new engine. Many engineers of eminence have inspected the engine at work, and have expressed themselves greatly pleased with its arrangement and performance. The length of the boat is 50 feet, beam 7·4. The engine was made for Mr. Willans by Messrs. Tangye, of Birmingham; and Messrs. Penn supplied and fitted the boiler, propeller, shafting, and all other gear.—*Iron.*

CAR AXLES AND COUPLINGS.

We continue below our series of extracts from Mr. E. H. Knight's "Mechanical Dictionary,"* selecting for the present paper a variety of interesting engravings of car axles, and a number of railway couplings,

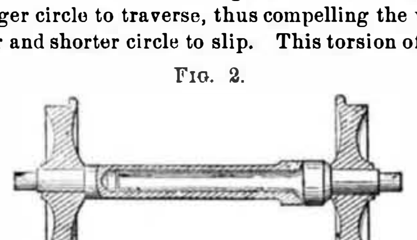
FIG. 1



Divided Car-Axle.

In Figs. 1 and 2 are represented two forms of divided car axle. When the axle is constructed of a single piece of metal, with the wheels fixed firmly thereon, it is subject to severe torsional strain in turning curves. The outer wheel has a larger circle to traverse, thus compelling the wheel on the inner and shorter circle to slip. This torsion of the axle

FIG. 2.

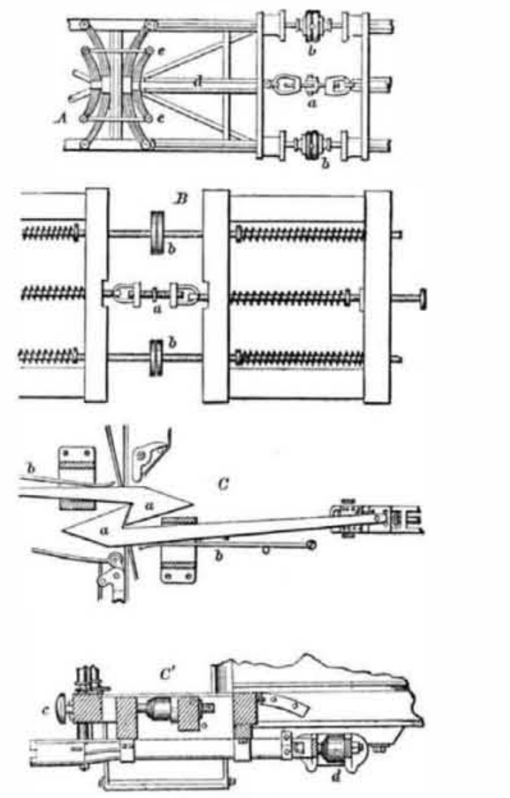


Hollow Divided-Axle.

s very detrimental, and the slipping of the wheel is equivalent to grinding on the rail, retarding the train. To avoid these difficulties, the axle has been made in two parts, examples of which construction are given in Fig. 1, in which the axle is divided at mid-length, the inner ends being supported in a box or sleeve, and in Fig. 2, which shows one portion of the axle hollow, forming a sleeve for the other part.

Figs. 3, 4, and 5 are sections, etc., of a number of car couplings. The English coupling. A, Fig 3, is a right and left screw shackle, *a*, on the median line, making a connection sufficiently rigid to compress the buffers, *b b*. The draw bar, *d*, of the coupling is connected to an elliptic spring, *e*, which diminishes the jerk of the cars in starting the train. Some of these features are also found in B, which is an old form of United States coupling, with buffers copied from the English. C and C′ are respectively plan and elevation of the Miller coupling, which connects automatically as the

Fig. 3.

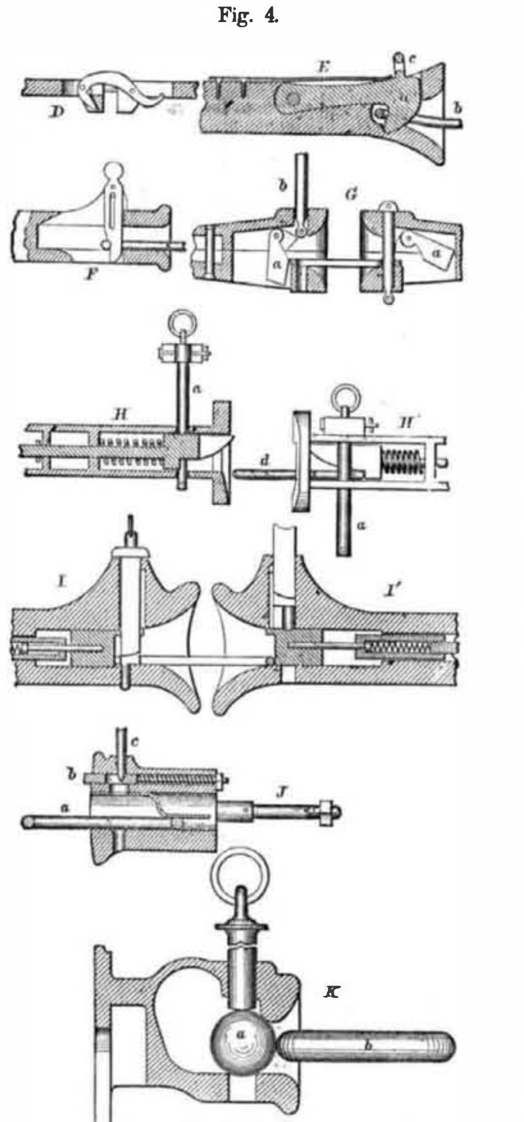


Car-Couplings.

respective point-headed hooks come in collision. The springs, *b*, keep the hooks together when connected. The lower view, C′, exhibits also the spring buffers, *c*, above the hooks, which act as fenders to the cars and deaden the blow as the cars strike against each other when the speed of the train is checked. The coupling hooks have, besides, springs, *d*, for the same purpose.

In Fig. 4, D is a falling latch hook. E has a gravitating

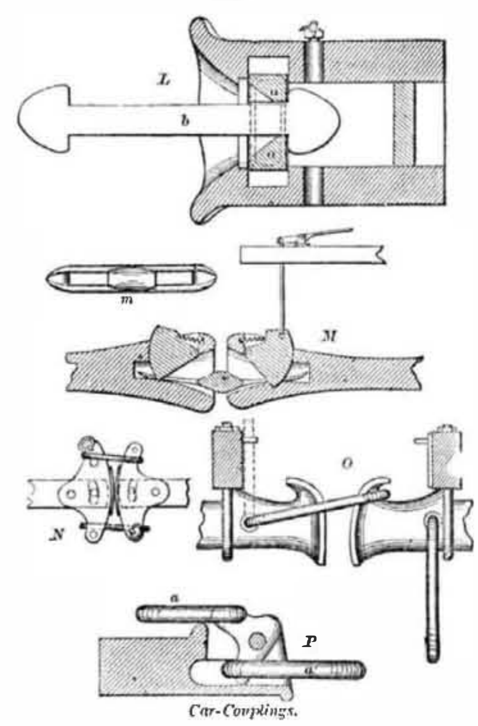
Fig. 4.



Car-Couplings.

hook provided with a spring, so that it yields to the thrust of the entering link in coupling. On the back of the hook, *a*, is a handle, *c*, which is lifted to uncouple the link. F has a vertically sliding bolt which rises automatically as the link collides with its lower inclined portion when coupling, and then falls down into engagement. G shows a pair of drawheads, in which the tumbling latch, *a*, holds up the pin until thrust back by the entering link. The pin, *b*, when fixed for coupling, rests on the toe of the latch. H H′ are two drawheads, in the first of which the pin, *a*, rests on a sliding latch, which gives way before the thrust of the link, *d*, a result already accomplished in H′. I I′ are two matching drawheads, in which sliding pistons hold up the link, and are pushed back in the same manner as described in the preceding case. J exhibits a plate to hold the projecting link, *a*, in coupling position, and a small sliding latch, *b*, above, to hold the coupling pin, *c*, which is dropped, when the drawheads come in actual collision, and thrust in the latch. K has a ball, *a*, which holds up the pin but allows same to fall when pushed back by the entering link.

Fig. 5.



Car-Couplings.

In Fig. 5, L has an arrowhead bolt which is grasped between spring jaws. M has a bar, *m*, with two slots. As the end enters the drawhead, it thrusts up the gravitating latch, which immediately falls into the slot of the bar. N is a plan view of a coupling in which each drawhead has a link which couples over a horn on the corresponding drawhead of the other car. O is an elevation of a pair of drawheads, each of which has a link which may be coupled over a horn on the other. P has a two-horned tumbler, one horn of which carries a link, *a*, which may couple to a corresponding drawhead, and the other forms a latch for a link, *a′*, proceeding from the other drawhead.

The Brain Not the Sole Organ of the Mind.

Dr. W. A. Hammond, President of the Neurological Society, recently delivered an address before that body upon the above topic. The discourse included accounts of the speaker's original investigations, and in general advocated the theory that the spinal cord shares with the brain the faculties of perception and volition. The following is an abstract:

Dr. Hammond began by saying that, where there is no nervous system, there is no mind, and that where there is injury or derangement of the nervous system there is corresponding injury or derangement of the mind, and proceeded to review at length experiments conducted upon living animals, the brains of which had been previously removed. A frog continues to perform those functions which are immediately connected with the maintenance of life. The heart beats, the stomach digests, and the glands of the body continue to elaborate the several secretions proper to them. If the web between the toes be pinched, the limb is immediately withdrawn; if the shoulder be scratched with a needle, the hind foot of the same side is raised to remove the instrument; if the animal is held up by one leg, it struggles; if placed on its back—a position to which frogs have a great antipathy—it immediately turns over on its belly; if one foot be held firmly with a pair of forceps, the frog endeavors to draw it away; if unsuccessful, it places the other foot against the instrument, and pushes firmly in the effort to remove it. Still not successful, it writhes the body from side to side, and makes a movement forward. All these and even more complicated motions are performed by the decapitated alligator, and in fact may be witnessed to some extent in all animals. The speaker had repeatedly seen the headless body of the rattlesnake coil itself into a threatening attitude, and, when irritated, strike its bleeding trunk against the offending body.

Dr. Hammond then proceeded to explain a large number of experiences under his theory. He said that the phenomena of reverie are similar in some respects to those of somnambulism. In this condition the mind pursues the train of reasoning, often of a most forcible character, but yet so abstract and intense that, though actions may be performed by the body, they have no relations with the current of thought, but are essentially automatic, and made in obedience to sensorial impressions which are not perceived by the brain. In the case of a person performing on the piano, and at the same time carrying on a conversation, we have a most striking instance of the diverse though harmonious action of the brain and spinal cord. Here the mind is engaged with ideas, and the spinal cord directs the manipulations necessary to the proper rendering of the musical composition. In somnambulism the brain is asleep, and this quiescent state of the organ is often accompanied in nervous and excitable persons by an excited condition of the spinal cord, and then we have the highest order of somnambulistic manifestations, such as walking and the performance of complex and apparently systematic movements. If the sleep of the brain be some-

* Publishers, J. B. Ford & Co., New York city.