mur is long and forms an open angle with the shaft, increasing the bases of support for the trunk. The whole vertebral column, with its slight alternate curves, and the well-poised, short, but capacious sub-globular skull are in like harmony with the requirements of erect position.

The widely separated shoulders, with broad scapulæ and complete cavicles, give a favorable position to the upper limbs, now liberated from the services of locomotion, with complex joints for rotatory as well as flexile movements, and terminated by a hand of matchless perfection of structure—the fit instrument for executing the behests of a rational intelligence and a free will. Hereby, though naked, man can clothe himself and rival all natural vestments in warmth and beauty; though defenseless, man can arm himself with every variety of weapon, and become the most terribly destructive of animals. Thus he fulfills his destiny as the supreme master of this earth and lord of lower creation."

JOURNAL OF PATENT LAW.

AN AUTOMATIC OVEN—A PATENTEE'S DODGE.

Sellers vs. Berdan.—This was an application by the defendant to the Court of Common Pleas of the City and County of New York, to compel the plaintiff to disclose a patent alleged to have been obtained by him in France.

It appears the plaintiff commenced a suit against the defendant to recover an amount claimed to be due for the construction of an automatic oven with the application of hydraulic power, alleged to have been ordered by the defendant; and to be used in France. It appeared from the papers in the case that Berdan and Sellers both agreed that a new patent would be necessary to protect the former in his right in consequence of the application of the hydraulic power. Defendant alleged that after the completion of the machinery, the plaintiff, without defendant's knowledge, went to London and Paris, and took out patents in his own name for the application of the hydraulic power; thus depriving the defendant of the use of the machinery which he had employed plaintiff to construct for him. The discovery was therefore asked by the defendant, with leave to inspect the patent in order that he might properly defend the suit.

The counsel for the plaintiff resisted the motion on two grounds: first that the existence of the patent was sworn to only upon information and belief; and second, that the taking-out of the patents did not prevent the defendant's use of the one constructed for him by the plaintiff.

The counsel for the defendant replied that a statement of the existence of a document on information and belief, and its possession by the plaintiff, were sufficient—especially when the opposite party came into court and made no denial; further, that, when the plaintiff had obtained a patent which gave him an exclusive right to use an article, he could not set-up that the defendant could use the patented article *notwithstanding*, because the patent was obtained in fraud of the defendant's rights; and that, perhaps, the defendant could compel the plaintiff to assign the patent to him; at least the plaintiff could not compel the defendant to pay for the construction of the machinery which their subsequent acts had rendered worthless.

The court reserved its decision on the argument; but it afterwards decided to grant the discovery.

RAPID STEAMSHIP PASSAGES.—A New York correspondent has prepared a list of the fastest trips made by transatlantic steamers. "The extraordinary passage of the *Vanderbilt* has hardly been noticed in the excitement about the fight. She made the trip from Southampton to New York in nine days, twelve hours and thirty minutes—the shortest western passage ever made. The following table is worth placing on record:—

	Left Liverpool.	Arr. at New York.	d.	h.	m.
1851. Baltic.....Aug.	6, 4 P. M.	Aug. 16, 6 A. M.	9	19	9
1853. Arabia.....Aug.	13, 2 P. M.	Aug. 23, 7.55 A. M.	9	23	55
1854. Baltic.....June	28, 1 P. M.	July 8, 1.15 A. M.	9	17	15
1857. Persia.....June	13, 2.15 P. M.	June 23, 6.56 A. M.	9	16	11
1858. Left Southampton.					
Vanderbilt..June	9, 7.30 P. M.	June 19, 10.30 A. M.	9	15	0
1860. Vanderbilt..April	18, 6.30 P. M.	April 28, 8 A. M.	9	12	30

Had it not been for adverse winds during the latter part of the trip, the time would have been reduced at least to nine days. We can expect nothing better than this from any ship afloat, except perhaps the *Adriatic*, on her homeward trip in May, or the *Great Eastern*, which will probably cross the Atlantic in June."

THE HEXAGONAL CELL OF THE HONEY-BEE.

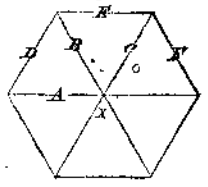
BY W. J. WEEKS.

"The same keen horns within the dark abode,
Trace for the sightless throng, a ready road."

"These, with sharp sickle, or with sharper tooth,
Pare each excresence and each angle smooth,
Till now in finish'd pride, two radiant rows
Of snow-white cells one mutual base disclose,
Six shining panels gird each polish'd round,
The door's fine rim with waxen fillet bound,
While walls so thin, with sister walls combined
Weak in themselves, a sure dependence find."

In common with the equilateral triangle and the square, the regular hexagon can also be united, side by side, to others similar and equal, without leaving intermediate spaces—a property not possessed by any other regular polygon of a greater number of sides; and while it is well-known to mathematicians that the regular hexagon affords greater capacity and strength, in proportion to the quantity of material, than either the triangle or the square, it is obvious to the most superficial obsever, that it is also better adapted to the insect form; but besides these advantages it has another property not common to any other figure, and which may be expressed as follows:—

Fig. 1



In every regular hexagon, the distance from its center to any one of its angles, is exactly equal to any one of its sides. Thus, in Fig. 1, X being the center, any one of the lines, A B C, &c., is exactly equal to any one of the sides, D E F, &c.; this is the crowning beauty of the regular hexagon, and it is this peculiarity which renders it so admirably adapted to the architectural instinct of the bee and other insects, which construct hexagonal cells.

Fig. 2

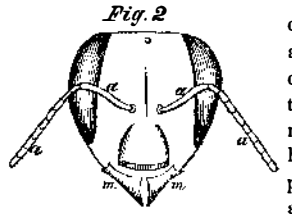
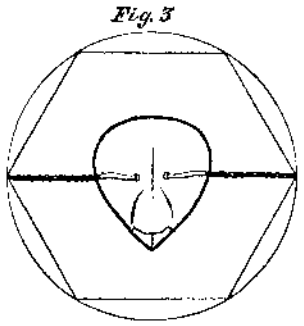


Fig. 2 exhibits the outline of the bee's head, and the anterior portion of it; *a a*, are the antennæ, and *m m*, the mandibles; the latter are hard horny organs, of a peculiar form, and have a lateral motion, they are used as occasion may require, in the various operations of biting, gnawing, compressing, drawing-out, smoothing, &c. They are the mechanical instruments. Each antenna consists of two portions, one end of the shorter is united to the head by a ball and socket joint and the other is articulated with the longer or fore-arm, the latter is divided into nine joints imparting flexibility; its extremity is rounded, and covered by a sensitive cuticle.

In the construction of the cells, the antennæ serve essentially as measures, and are of such a length that the bee has a precise rule for the due and proper size of its cells. The scope of the antennæ is such that, extended,

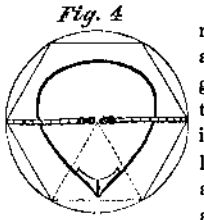
Fig. 3



their extremities can touch any part of a circle in a plain anterior to the head, and again, the articulations being brought together in front, the tips of the fore-arms can in like manner touch any part of a smaller circle; hence, it is obvious that this admits of the reaching of the opposite angle of the greatest regular hexagons which can be inscribed within those circles respectfully, see Figs. 3 and 4.

Practically, the bees construct but two kinds of regular hexagonal cells, the first designed for the embryo worker, has each side equal in length to the forearm of the antenna, and the second, for the embryo drone, has each side equal in length to the whole antenna. Although it might be possible for the bee, by flexing the forearm, to construct a regular hexagon somewhat smaller than the first mentioned, yet such a cell would be useless, as the smallest now constructed is just large enough to admit the body of the adult worker, or the queen in the act of depositing her eggs. The maximum size is also limited; the greatest possible regular hexagon which the bee can construct, is one whose diameter between opposite angles, does not exceed the extent of the antennæ, together with the space of forehead between their sockets; the diameter of the drone cell is less than this by the space just mentioned, as if it were laid out by the sweep of only one of the antennæ, but the greatest diameter of the embryo queen-cell corresponds with the stretch of the two antennæ in opposite directions.

Fig. 4



We may often observe, in the recently perished bee, these organs assuming apparently the very angle of sixty degrees, as shown by the dotted lines in Fig. 4, thus indicating, in the plainest of sign language, one mode of their capable application. They also serve as delicate and sensitive calipers, both being indispensable, which, during the progress of the work are frequently applied, one upon each side, to the several walls of the cell, until the wax is drawn out to its utmost tenuity compatible with strength.

The intimate relation between the length of the antennæ and the size of the cells was discovered by the author of this article, in the year 1852, he being previously acquainted with the properties of the hexagon. Any one, knowing this relation, may now understand how thousands of cells in a single hive may be all of one form and size, how every individual cell of these thousands may be precisely similar to every cell of the aggregate millions in all other hives, and how, the world over, wherever this species of bee (*apis mellifica*) exists, all its regular hexagonal cells of the two classes—worker and drone—can be exactly equal each to each, for every adult worker in its antennæ is provided with an equal rule and compass. The regular hexagon, with its unique peculiarity, was doubtless a part of the earliest creation of material forms; and in the subsequent production of animal life, Infinite Wisdom supplied the bee with organs adapted to that peculiarity, and endowed it with the instinctive knowledge necessary for their proper application.

CLAY RETORTS.

MESSRS. EDITORS:—Under the head of "Clay Retorts," in your last number (May 12th), Mr. J. P. Kennedy, gas engineer, of Trenton, N. J., states that "many superintendents are under the impression that clay retorts cannot be worked without an exhauster; but this is a mistake—they require the aid of an exhauster no more than those made of iron." Now the question would seem to be, "Are iron retorts not benefited by the use of an exhauster?" In order to demonstrate whether this is or is not so, let such as have experimented give their results. In a small gas-works, where there is generally a superabundance of purifying surface, and where the back pressure is no greater than the pressure of the seal of the dip pipes in the hydraulic main, there is no advantage to be gained hy the use of an exhauster. But, where the make or consumption of gas is increasing and the limited purifying apparatus and other causes produce a pressure by several inches greater than exists in the hydraulic main (if only from two to four inches more), the deposit of carbon will soon show itself and accumulate rapidly; in this state of things, the good effects of an exhauster will be quickly apparent.

Having suffered much from the accumulation of carbon by unavoidably great back pressure, I had an exhauster put up, having still the same iron retorts in use. In less than two weeks the whole of the carbon was consumed away, and no more was formed. I worked the same retorts over a year after that, whereas, with the same amount of carbon as they had in them previously, they would not have lasted six months; the change was so great as to be a source of repeated remarks among the workmen. I now use all clay retorts and have had some ovens of threes and fives last nearly three years, with a pressure of from 10 to 12 inches in winter; repeated trials have shown a reduction of yield of gas of from 10 to 12 per cent when the exhauster was stopped, and with the same kind and amount of coal. An exhauster will keep down any back pressure, and the retorts will then bear an increased quantity of coal, from 20 to 25 per cent more to each charge, and burn it off in the same space of time. Nearly all the works of any note in England, Scotland, and other parts of Europe are adopting exhausters.

There are some articles in the late numbers of the London *Journal of Gas-lighting*, in which the report of a superintendent of a small works states the advantages he has derived from the use of an exhauster, and he also recommends it to others. Such is my—

EXPERIENCE.