bought in the open market and include a carbureter for mixing air with the gases before they enter the cylinder. To this carbureter a governor should be attached. Although the engine will run without the aid of a governor, its steady running is better controlled by the use of one. With a little added mechanism the governor could be attached to the inlet valve so as to control its lift. Other accessories needed are a spark plug, of which two or three should be kept on hand in case one should give out, a spark coil, switch and batteries, or a magneto in place of the spark coil. A muffler may also be desirable to deaden the noise from the explosions; but if the exhaust is led from the engine through a 2-inch pipe, which increases in diameter to 2½ inches under the floor to 3 inches for a length of about 6 feet on the outside of the building and to 3½ or 4 inches for the balance of the distance, the sound will be deadened so that the exhaust is hardly heard.

This engine is designed to give a M. E. P. of 60 lbs., compression 60 lbs., explosive pressure 200 lbs., with the normal speed of 325 revolutions per minute. At this speed it should develop five actual horse-power. The horse-power will depend largely on the quality of the gas used. Some natural and coal gases may not be able to develop over 4 horse-power. With illuminating gas the engine may easily be run up to 7 horse-power. Any of the explosive gases may be employed. If a special carbureter be used that would start and run the engine with gas until the cylinder was sufficiently hot, kerosene may be turned in to take the place of the gas, with good results.

THE UTILITY OF INVENTIONS.*

By JOHN E. BRADY.

THE laws of the United States provide that patents may issue for any new and useful art, machine, manufacture, etc., under certain conditions, and hence it follows that, in order to be patentable, an invention must, among other attributes, disclose utility. It is not sufficient that an invention be new; it must be useful as well, or it cannot be accorded the protection of the patent laws. By useful invention is meant such a one as may be applied to some beneficial use in society in contradistinction to an invention which is mischievous or injurious to the morals, the health, or the good of society. A useless invention, even if patented, is not and never will be of any profit to the public, and the patent granted thereon is void. New inventions in regard to some trifling article of dress, such as "hoops, or crinolines," or, in the language of Judge Story, "a new invention to poison people," are not patentable. The one is frivolous and the other mischievous. Page vs. Perry, 1 Fish. Pat. Cases 298. Utility, as predicated of inventions, means industrial value; the capability of being so applied in practical affairs as to prove advantageous in the ordinary pursuits of life, or to add to the enjoyment of mankind. But a mere curiosity, a scientific process exciting wonder, not yet producing physical results, or any frivolous or trifling article or operation not aiding in the progress nor increasing the possessions of the human race, whatever be its novelty, and whatever skill has been involved in its production, does not fall within the class of useful inventions nor become the subject matter of a patent. Robinson on Patents, Vol. 1, p. 463. In Crouch vs. Speer, 1 B. & A. Pat. Cas. 145, it was said that the test whether an invention is useful in the sense of the patent law is not whether it is not mischievous or hurtful, or insignificant, but whether it is capable of use for a purpose from which some advantage can be derived. If it be useful in this sense, the degree or extent of its usefulness is altogether immaterial. It is not necessary that it should be the best means of producing a desirable result, but a means, although inferior to others, of producing it.

Inventions which accomplish definite practical results may nevertheless possess such attributes as destroy the benefits that otherwise they would bestow upon the public. Inventions whose chief or only value resides in the facilities which they afford to men to perpetrate some wrongful injury either by fraud or violence upon each other, are thus regarded as destitute of real utility. For the same reason arts or instruments which, if completed and in actual use, might be of benefit to their employers, are sometimes held to be devoid of real utility on account of the great risks incurred in their construction. The courts, in their consideration of this subject, must necessarily contemplate the entire scope and effect of the invention, as well upon the maker and operator as upon the consumer; and if the net result to the community at large is not a benefit, the inventor has no claim upon the public.

The acts of Congress which authorize the grant of patents for designs, were plainly intended to give encouragement to the decorative arts. They contemplate not so much utility as appearance. The law manifestly recognizes that giving certain new and original appearances to a manufactured article may enlarge the demand for it, may enhance its salable value, and may be a meritorious service to the public. It, therefore, proposes to secure for a limited time to the producer of those appearances the advantages flowing from them. Gorham Company vs. White, 14 Wall (U. S.) 511. Utility is not negated by the fact that the manufacture covered by the patent has no function except to decorate the object to which it is designed to be attached. In such cases utility resides in beauty. Whatever is beautiful is useful, because beauty gives

pleasure, and pleasure is a kind of happiness, and happiness is the ultimate object of the use of all things. Walker on Patents, p. 73. The Westinghouse Electric & Manufacturing Company, being the owner of a design patent (No. 24,416) issued March 22, 1902, to Albert Schmid, brought an action against the Triumph Electric Company, seeking to enjoin the latter from infringing its alleged rights under the patent. The patent involved covered a design for a configuration of a frame for electrical machines. It was held that the word "useful" in the section regulating the issue of design patents does not require that the shape or configuration of an article, in order to be patentable, shall add some new utility to the article, but is used merely for the purpose of excluding such things as might have a vicious or corrupting tendency, and that a new and original design for an article may be patentable where it merely improves its appearance. But it was further held that, assuming that a frame for an electric machine might be made the subject of a design patent, the frame design in question was not properly patentable for the reason that it was neither new nor original in view of the existing state of the art. The only originality which the counsel for the complainant could reasonably claim for the design patented was found in the curvature of the bases of the pillars for supporting the shaft and of the supports to the cylinder frame for the field; and these were considered differences which would suggest themselves to any workman, and which did not involve the exercise of inventive genius, which is as essential to the validity of a design patent as it is to the validity of a mechanical patent. Westinghouse Electric and Manufacturing Company vs. Triumph Electric Company, 97 Fed. Rep. 99.

It seems that utility is negated if the function performed by the invention is injurious to the morals, the health or the good order of society. Thus, an invention to improve the art of forgery, or one to facilitate the spread of a contagious disease, or one to render water or air intoxicating would, of course, be unpatentable for want of utility. The more completely such an invention could perform its function the more objectionable it would be in this respect. Walker on Patents, p. 73. In the case of National Automatic Device Company vs. Lloyd, 40 Fed. Rep. 89, the complainant moved for an injunction restraining the infringement of a patent for a "toy automatic race course." The device covered by the patent consisted of a shaft projecting upward from the center of the base of a circular shell or case, to which shaft a clockwork mechanism was so geared that it could be made to revolve rapidly by releasing the escapement of the clockwork. On the shaft were mounted two or more radial arms, to the ends of which were attached small toy figures of horses. The clockwork was released by dropping a coin through a slot in the machine, whereupon the shaft would revolve, carrying the radial arms with it, for a short time, when the clockwork would be shut off, allowing the arms to revolve of their own momentum. The proof showed that the only use to which the device had been put was to install it in saloons and other drinking places, where the frequenters thereof might lay bets as to which toy horse would be the last to stop or would stop nearest a certain designated point; in other words, the machine was used only for gambling purposes. For this reason the machine was held not to be a benefit to society or "useful" within the contemplation of the patent act, and the patent was declared void. It was urged that the machine was susceptible of being utilized as a toy or child's plaything, but the fact that no such use of it had been made was considered a sufficient answer to that contention.

Inventions the object of which is to afford amusement and diversion, are classed among patentable subjects; but only the mechanical agencies employed can be patented. Under this rule it was held that the patent of the Paul Boyton Company, covering an inclined gravity railroad terminating in a body of water, which provided an amusement popularly known as "Shooting the Chutes," was invalid, one of the reasons being that, in view of the old art of launching ships, there was no patentable novelty in the combination of an inclined railway located near a body of water and a boat-shaped car or toboggan, adapted to move downward over the railway and be propelled forwardly upon the water by the momentum derived from its descent. Paul Boyton Company vs. Morris Chute Company, 82 Fed. Rep., 440.

In the Cushman case, 1 McArthur's Pat. Cas., 569, an electrical patent was refused on the ground of the absence of utility and an appeal was taken from the decision of the Commissioner in so refusing. The device for which a patent was sought consisted of an improved method for protecting objects from the effects of lightning by surrounding that part of the lightning rod which is imbedded in the earth with a galvanic battery. Its construction and functions were described by the inventor in the following language: "To facilitate the discharge of the electricity from the conductor to the earth is the object of my present invention, and it consists in surrounding that part of the lightning rod imbedded in the earth with plates of dissimilar metals, arranged in such manner as to constitute an open galvanic battery. Electromotive power will divide the electricity on the metallic plates and, as they are insulated, they will act as a conductor of the electricity that is opposite to that of the air. Should there be a high electrical tension of the air, by this means the electrical fluid conducted through the rod is more readily discharged by uniting with the opposite electricity as it accumulates on the surface

of the plates. When the discharge flows from the earth to the air, then the rod conducts from the plates such electricity as is opposite to that of the air." The reason which the Commissioner gave for refusing a patent was that the intensity of the action arising from either the copper or the zinc plate, or both, in the earth, is thousands of times too small to be sensible as compared with that of a flash of lightning. "The latter has force enough to strike through hundreds or thousands of feet, or sometimes through miles of air. The former has not force enough to strike through the thousandth part of an inch. These are well known facts and the thing must be entirely without practical effect." The court was satisfied that the device in question could be put to no beneficial use and the Commissioner's refusal was affirmed.

The degree of utility is not material and a patent may rightfully issue, so far as that quality is concerned, provided the invention be of some use and benefit. Nor does the simplicity of a device indicate in any way the absence of utility, for this is a recommendation of the usefulness of the article rather than an objection thereto. The existence of utility in an invention is not to be determined by comparing it with other arts and devices, but is rather to be ascertained by an examination of the particular art or device in question. It is not essential to the patentability of a device that it should supersede or be superior to others previously used for the same purpose; nor does the fact that an invention has been displaced by some subsequent invention import a lack of utility. If, however, a patented article rapidly takes the place of all others of similar kind and is successful commercially, these are considerations tending to show that the public welfare has been advanced by its production and that it is characterized by utility within the meaning of the patent laws.

PEAR-SHAPED STARS.

By ALEXANDER W. ROBERTS, B.Sc.

ASK ten men what is the shape of every star that shines in the brow of night, and nine out of the ten will at once reply, with all the assurance of settled conviction, "Round like a globe." And thus it happens that when the mathematician or the astronomer reveals to our knowledge the existence of such strange stellar forms as egg-shaped, pear-shaped, or even cigar-shaped stars, our mind rises against such apparently deformed orbs in a kind of revolt. Like children of a larger growth, we say to ourselves, "I know that the stars must be as round as a billiard ball; if it does happen that there exist somewhere in the great reaches of space stars shaped like a pear or an egg, then these bodies must be stellar freaks, sports in the well-ordered economy of Nature. They have little, and can have little, in common with such spheres of light as Sirius, Canopus, or Vega."

Thus do we reason unreasonably, for a pear-shaped star is neither a freak nor a monstrosity; and, instead of such bodies having nothing in common with the more highly developed suns that shine in our sky as stars, they represent the first stage in the evolution of those systems, stellar and solar, that impress all minds by their grandeur and majesty. A pear-shaped star is, indeed, a kind of celestial ugly duckling; one day its strange, lop-sided figure will give place to a stellar system, perfect in its form, harmonious in its movements. Our own sun, for instance, now a star in the fullness of its beneficent manhood, with all its grown-up family of planets and moons clustering round it, a perfect sphere of life-giving flame, was, ages ago, in all probability a pear-shaped mass of chill, nebulous matter, a vast, kite-shaped figure, shedding worlds—Neptune, Uranus, Saturn, Jupiter, Mars, the Earth, Venus, and Mercury, as it contracted, and still contracted, through untold flights of time.

It is thus that Nature always works. There is no stagnation, no fixity of type, in her ample dominions. Whether it is the great majestic worlds that fill the night with beauty and splendor, or the myriad grains of sand that give a silver girdle to many a sea, each and all come under the despotism of the same inflexible laws of development as regards form and structure and movement. The form of each stellar orb and orbit, the shape and position of each grain of sand, are ever changing, "ever giving place to new," under the stress and strain of compelling circumstances.

What is a central sun to-day, a perfect ball of fire and flame, must ages ago have been a lop-sided mass of cosmic dust, a bulging, nebulous cloud, slowly revolving and yet more slowly contracting. A pear-shaped star, instead of being an anomaly, is therefore a link, one of the first links, in the great chain of events that connect the present time in our world's history with that far-off day in the beginning of things, when our "good green earth" was without form and void, and darkness covered the yet unborn world in its generous folds.

But to come to the heart of our subject: what actual proof have we that pear-shaped stars do exist? The theoretical reasons for their existence are many and unchallenged. Years ago such mathematicians as Darwin and Poincaré, with the spirit of prophecy upon them, delineated the form and fixed the place in cosmic history of such stars. Theirs was one of the "visions splendid" of astronomy; but has the vision become one of the realities of practical science? Philosophy demands the existence of pear-shaped stars as the material, the raw material, out of which stellar systems, binary and multiple, sirian and solar, are fashioned; but has any one seen them with his bodily eyes? The

* Electrical World.

eyes of faith did truly discern them decades ago; but faith is not everything in science!

It is all very well to say that stellar evolution demands this form of star as the progenitor of more developed systems. The question that the ordinary man puts is: Have we seen such stars, measured their irregular form, estimated their oblateness, photographed their unfamiliar form? We must confess that no one has as yet done any of these things *directly*, for with the largest telescope in the world the brightest known pear-shaped star, Beta Lyræ, appears simply as a point of light. No stellar disk is visible, or indeed ever can be, as all the stars are too remote from earth for that to be possible. "Then, how do you know, apart from theoretical considerations and proof, that Beta Lyræ, or any other star that shines in the sky, is pear-shaped if its outline has never been seen?" is a question I think I hear asked, and with some show of reason, for to many it may seem a strange thing to write an article on a phenomenon no one has ever actually seen. To such readers, the gulf between a conviction that some stars in the sky are probably pear-shaped, and the certainty, born of actual evidence, that this, and this, and this star is pear-shaped, is as wide as that between a dream and a reality.

Now, let me try to explain how astronomers are able to say that this, and this, and this particular star is pear-shaped; and how they are further able to measure, roughly no doubt, the flattened figure of these stars. In 1905 the scientific world was deeply interested in an important total eclipse of the sun which took place in Spain. Men traveled over continents and seas to observe it. They knew the exact hour when it would happen. For years before its occurrence astronomers had calculated, with almost perfect precision, the moment when the eclipse would begin at any given spot, how the obscuration would increase, when it would be total, and how and when and where the dark shadow would disappear from off the sun's face.

Now, all these calculations were based on the assumption that the sun and moon are practically spheres—a true assumption. If they are not spheres, and if the calculations were founded on the assumption that they are, then there would be important discrepancies between the times of eclipse as theory predicted them and actual observation noted them. To put the matter still more plainly: suppose that the moon is of the shape of an egg and the sun of the form of a pear, it will be at once evident that the manner, duration, and date of eclipse will be somewhat different under these conditions from what they would be if the sun and moon were spheres. Thus, since the disks of both bodies are considerably elongated, the duration of eclipse will be correspondingly lengthened. There will also be a pertinent difference in the character of the eclipse. The sun and moon being no longer spherical, there would be a distinct want of symmetry between the decreasing and increasing phases. Indeed, there would be a hundred and one such differences, all due to and depending on the peculiar form of the eclipsing stars. But just as astronomers are able to tell us all about an eclipse on the assumption that the eclipsing bodies are perfect spheres, so could they tell all about an eclipse, its duration, its extent, its character, if the bodies were of any other shape. The calculations would be a little more troublesome, but they would not be unsurmountable.

Now, let us turn our eclipse problem the other way about. Let us suppose an astronomer who does not know the shape of the sun or the moon to observe a solar eclipse. He watches its beginning, the time and place; with a photometer he measures the steady decrease in brightness of the sun, he notes the time of each observation, he determines the moment of greatest darkness; he carefully measures the decrease of eclipse, its rate, its duration, its character; finally, he determines the whole brightness of the uneclipsed sun. When our astronomer has marshaled all his observations he has the data necessary for a fairly accurate determination of the *shape* of the sun and moon. He does not require to look at these bodies, or to measure them, or to photograph them. His eclipse observations give him all the information he wants. When he has dealt with his figures and facts he can tell us whether our satellite is circular, elliptical, or oval with as much certainty as if he had placed it between gaging rods.

It is in this reversed form—namely, to find the shape of two eclipsing bodies from the circumstances of their eclipse—that the problem presents itself to those who follow out the search for pear-shaped stars.

We have in certain articles already published in this journal written concerning stars that vary regularly in brightness, because their light is eclipsed by a circling companion. Such stars are called Algol variables, and they wax and wane in brightness after the fashion of the winking eye of a lighthouse. Now, although the ebb and flow of light of an Algol star seems very different from the majestic wave of night that sweeps swiftly across the sun's face during a solar eclipse, it is a difference in intensity and range, not in kind and character. The sun is near us; the stars are indefinitely remote. When we witness, therefore, the fluctuations in brightness, the steady waning and waxing of light of an Algol variable star, we know that we are simply watching a solar eclipse away out in the far land of stellar distances; and the same geometrical laws of sunlight and shadow govern both eclipses—those of our sun, those of an Algol variable star. If the obscuring body is spherical, the eclipse

will take place in a given definite manner; if the obscuring body is not spherical, then there will be a distinct departure from the regular symmetrical eclipse which takes place under the former conditions—that is, if we have observed carefully a stellar eclipse we are in a position to tell the shape of the eclipsing stars, and our conclusions will be as assured as if we examined, measured, or photographed the occulting disks.

When, therefore, a star has been observed to vary in brightness in such a manner as to indicate that it is an eclipse or Algol variable star, a watch is kept over all the vagaries of its variation in order to arrive at a determination regarding the shape of the star. The observer determines the instant when the star begins to decrease in brightness—that is, he observes the beginning of eclipse; he measures with all possible accuracy the decrease in brightness, its rate and duration; he fixes the instant of greatest eclipse; he compares the increasing phase with the decreasing, in order to detect any want of correspondence between the two; finally, he estimates the amount of brightness of the star when uneclipsed. All these facts ascertained, he is in possession of definite knowledge regarding the shape of the eclipsing stars. He is in possession of a good deal else besides this, but one concern at a time must satisfy us.

Up to the present the researches of astronomers in the direction we are now considering have been to reveal the existence of ten pear-shaped stars, five in the northern and five in the southern hemisphere. This may seem a very meager harvest to those who are unacquainted with the difficulties that attend the search for such stars. To those who do know and understand the difficulties, the discoveries already made would seem to indicate that the number of pear-shaped stars in the universe is much greater than one is inclined to allow. Yet, that a not inconsiderable portion of the material universe should be in the morning of its long, long day is not surprising, surely. The ten stars discovered represent all degrees of oblateness, from bodies almost as elongated as a torpedo to orbs nearly spherical in form.

Of the ten stars, or rather systems, two are of special interest. In the case of these two systems the component stars are so near one another that they touch, and at the point of contact they merge into each other. It is very difficult, therefore, to say what exactly is the shape of these figure-of-eight stars. Such a system must be in a state of the most unstable equilibrium; and one day the centrifugal force will prove too strong for the slender, ever-changing nexus that binds the twin companions together. In that day *snaps* will go the connecting link. When this takes place there will be for both stars a period of stupendous unrest. From center to circumference the vast bodies will oscillate in great swelling pulsations, gradually dying down to a sobbing dispeace. Thus are worlds born!

Two important facts emerge from a closer study of our ten pear-shaped stars. First, the nearer two companions of a system are to one another the more oval are they in form; second, there is distinct evidence, in the case of at least two of the ten systems, that the component stars are slowly receding from one another.

An acquaintance with the laws of gravitational physics would lead us to expect the first of these conclusions; for the power of any body to distort or to raise tides upon another body depends on the distance the two are apart. We have in our own tides a striking example of the force which a small body exerts upon its primary, even when that pull is considerably weakened by the long distance over which it has to travel. Under the compelling stress of the moon's attraction, as we all know, a great swell of waters, in rhythmic surge, sweeps round the globe, bringing to estuary and harbor, river mouth and landlocked bay, the rise and fall of the cleansing, purifying sea. What would the gigantic strength of the moon's tide-raising force be if it were fifty times nearer our earth than it is? In that case its irresistible pull would pile the waters of the ocean into a tide sixty miles high; the terrific lateral strain would crack the rocky ribs of earth as a man cracks a walnut. With a moon circling at our very doors the earth would no longer be an orange-shaped globe; it would be a pear-shaped world. But what a world: air and sea and shore reverberating with the thunder of creaking, grinding rocks, and the wash and boom of great tidal waves—a dead world!

The second fact also follows naturally from a well-known law of stellar dynamics. The law is this: if two bodies are near enough to raise tides on either of them, this very expenditure of tide-raising energy shoves the circling bodies farther and farther apart in an ever-widening spiral. The forces, therefore, which tend to bind two stars together—namely, their attraction—are in reality the means of their separation and disunion. The reflex action of the tides is to gradually weaken the power to raise them. Thus does Nature most harmoniously work out her great schemes for the evolution of worlds and systems of worlds.

Given the operation of these two great laws, it is easy, I think, to predict what the future history of a pear-shaped system will be. We can trace its development from the moment of its birth as a dual unity right on to the day when, after much travail, it has become a system of worlds where life is possible and probable. The fissiparous principle—which seems as inherent in matter as it is in the lower orders of animals, and of which the pear-shaped form is the outcome—compels the rotating, tenuous, unstable mass to shed at vast intervals its brood of infant worlds. But

this disintegration does not go on for ever; another, and a third, law supervenes to prevent practical annihilation, or else the universe would become an aggregation of infinitesimal grains of matter, finally dissolving into space and leaving "not a wrack behind." The conserving and preserving law to which we refer is that which compels a gaseous body to go on contracting until at last its density is so great that further contraction is impossible. When this end is reached disintegration ceases.

Now, if we are thus able to look down the endless corridors of time, and to witness the slow evolution of ordered systems from a primeval egg-shaped mass of world-stuff, what is to hinder us from looking backward over the way we have traveled? May we not retrace our steps until we reach that natal day when our earth rose into being as a gaseous wart on the misty folds of a nebulous sun? But if this way be too far for even the keenest vision, we may follow with sure sight the life story of our planet back to the hour of the moon's birth.

We have already stated in this article that theory demands for the genesis of our satellite a Siamese-twin, pear-shaped, earth-born system; and we have seen that analogy supports the demand. Now, there are those who, perhaps overventuresome, point to the very spot where our satellite broke away from its mother-earth. They tell us that over the spot where the Pacific Ocean now rolls in long silver waterbreaks, the moon gathered to itself a separate existence, and that under the surface of this spacious stretch of sea, full three thousand fathoms deep, may still be found the scars which mark the place where a world was born.

When was this birthday? In the beginning of things, is about the most satisfactory answer we can give. But if we wish to place some reasonable span between that vague "beginning of things" and the present day, we may state, yet with some hesitation, and with no small uncertainty, that at the very least one hundred million years measure the moon's age as a separate world.

A burnt-out cinder, a dead world, a desolate land of fierce extremes of heat and cold, are the names we hurl at the friend that has companioned our earth for over a hundred million years. If it is dead, a dried-up cinder, a furnace and an iceberg by turns, it has had its day of good things. It was once so near the earth that it modeled its mountains and seas; but as the years came and went it drifted farther and farther away, till at last a heave of the ocean in greeting is all earth has to give to its eldest born.

What the future of our own planet may be does not concern us here; an excursion into such a field of inquiry does not fall within the area of an article on pear-shaped stars; but the question is certainly of interest, and I hope at a future opportunity to indicate what answer science has to give to it.

Now we return to the point from which we started, and we have to modify a certain thought expressed in the opening paragraphs of our article. After all, a spheroidal world bears the last touches of Nature's kindly formative hand. A round globe is the finished product of many evolutions; and if our minds have grown instinctively abhorrent of pear-shaped stars, it is because life as we know it on such tide-distressed worlds is an utter impossibility. Their substance is as diaphanous as a summer cloud; in the space of a few hours their huge bulk, sometimes as much as three hundred million miles in diameter, contracts and expands through a range of over a million miles. Storm and strain are the spirits that brood over their vast, tumultuous, shoreless wastes; there is ever the clash of atoms and the surge of sorely tossed titanic waves. Majestic in their spaciousness, impressive in their stupendous movements, their importance, their human attractiveness, lies in their potentiality, in their promise. They are worlds in the making.—Chambers's Journal.

Col. R. E. Crompton has devised a new measuring machine, combining accuracy with rapidity in working. With this measuring machine, which has been designed for observing length differences due to the heat treatment of specimens of steel, measurements of objects from 1 inch to 6 inches long, not differing among themselves more than a quarter of an inch, can be made and entered on the test sheet at the rate of one per minute. The accuracy obtainable is greater than 1 in 200,000. The end pressure is obtained by a spring and electric contact. The accuracy is due to extreme solidity of construction, 100-thread per inch screw 4 inches long in the nut, which is corrected by a spiral profile device.

New vegetable products of hitherto unknown composition were recently exhibited at the Royal Society. (a) Wax of the *Raphia* palm of Madagascar (*Raphia ruffia*), obtained from the leaves. This consists principally of two solid aliphatic alcohols, the chemical constitution of which is at present under investigation at the Imperial Institute. (b) Oil of *Origanum hirtum*, or *onites* of Cyprus. This is found to contain cymene and carvacrol, together with a new terpene and alcohol. It has been introduced into perfumery. The oil of another thyme, *Origanum maru*, of Cyprus, closely resembles oil of marjoram. It contains terpinene, terpinol, and a new crystalline alcohol ($C_{10}H_{17}(OH)_2$), which is at present under investigation. (c) Oil obtained from the *Pimenta acris* of Mauritius. This oil contains phellandrene and eugenol, and may be of value in perfumery.