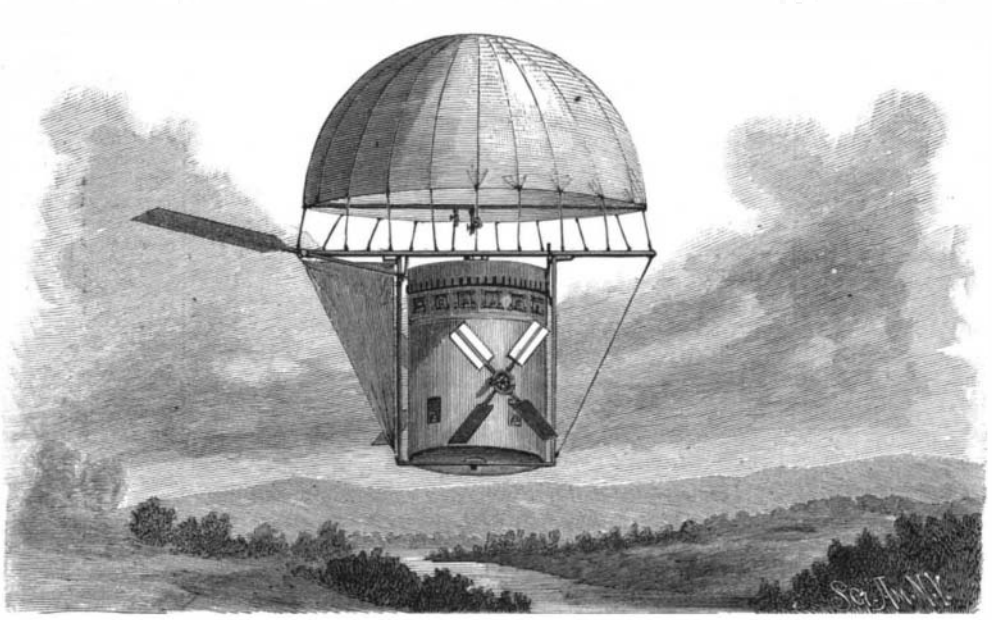
AN AERIAL SHIP.

The construction for navigating the air represented in the illustration is designed to be readily guided and controlled in its travel, irrespective of the direction of the wind. It has been patented by Mr. William N. Riddle, of Crowley, Texas. Its main body is substantially of an upright cylindrical form, and is divided horizontally into two compartments, the lower one for freight and the operative mechanism and the upper one for passengers. The body is centrally pivoted at its upper end to a main frame piece above, the lower end of the body also being centrally pivoted in the horizontal member of a yoke, in which the body is suspended from the frame piece, cords serving as braces. A circular rack, controlled by a spring catch upon the upper end of the body, holds the latter stationary in any required position in traveling around its vertical axis. Connected with the yoke and the stay cord at one side is a stationary rudder, and a laterally projecting second rudder is pivoted to one end of the main frame piece above, this rudder being capable of adjustment up or down, and being locked in position by a lever handle engaging a rack on the frame piece. Attached by cords to the latter is an upper gas receptacle divided into compartments, one above the other, united to form but a single buoyant chamber, but so connected with one another by central upright tubes that if one compartment collapses or bursts the others will hold up the ship. To propel the vessel, a horizontal shaft projects from each side, each carrying two upright partly circular tracks, one below and the other above, between which an upright propelling wheel is arranged to rotate upon the shaft. Each wheel is driven or rotated by gearing actuated by any suitable prime mover or motor within the body of the vessel, and the construction of the wheel is such that the paddles will have a feathering action, striking the air on their flat side during half of the revolution of the wheel and presenting their edge surface to the air during the other half of the wheel's rotation. The construction is such that the position of the wheels may be changed to give their paddles a flat or edge presentation to the air as desired, and to move the vessel upward or downward when necessary, it being designed that in lowering the ship it will not be necessary to permit the escape of the gas in the buoyant chamber.



RIDDLE'S AERIAL SHIP.

Gold Alloys.

Prof. Roberts-Austen has drawn attention to the fact that the properties of gold are changed in a most remarkable manner by alloying it with small percentages of other metals, and he lately exhibited a new series of alloys of this metal with aluminum. One of these alloys, containing 20 per cent of aluminum, forms an exception to the usual rule that the melting point of an alloy is lower than that of either of its constituents. This alloy has a fusing point above that of gold, the most infusible of its constituents. Curiously enough, the alloy with 10 per cent of aluminum follows the ordinary rule. These alloys have the most brilliant colors. The 20 per cent alloy is a brilliant ruby in tint, while those containing greater percentages of aluminum are purple in hue.

IT is stated that wasps' nests often take fire, supposed to be caused by the chemical action of the wax upon the paper material of the nest itself. This fact may account for many mysterious fires.

INGLETON'S IMPROVED STEAM PLOW.

The accompanying cut, which is from a photograph taken while the machine was in operation, represents the rear view of a steam plow designed and manufactured by Mr. E. Ingleton, of Brantford, Canada, an engineer who has had some 18 years' experience in steam cultivation and steam drainage in England, Germany, and Russia, and with every known system. The apparatus is doing some excellent work, and is not only a working but a commercial success. As much as three acres per hour have been plowed in a most excellent manner, and the average of a day's work may be set down at 20 acres, which is being done at a cost of 45 cents per acre.

As will be seen from the engraving, this plow is an entire departure from everything yet attempted in steam cultivating machinery, inasmuch as the plows operate across the track of and at right angles to the travel of the engine. By this means a serious objection has been overcome. In nearly all the attempts of steam plowing made on this continent, the system of direct haulage by traction engines has been adopted. It may be stated, however, that so long as the propelling wheels of a traction engine have to depend upon the loose and ever-changing surface of the soil for a sufficient "grip" to haul a gang of plows, so long will all attempts in that direction prove unsatisfactory. It is admitted that in dry summer weather, when the land is hard and traveling good, a traction engine will haul quite a large gang of plows; but it is different with anything in the nature of a steam plow.

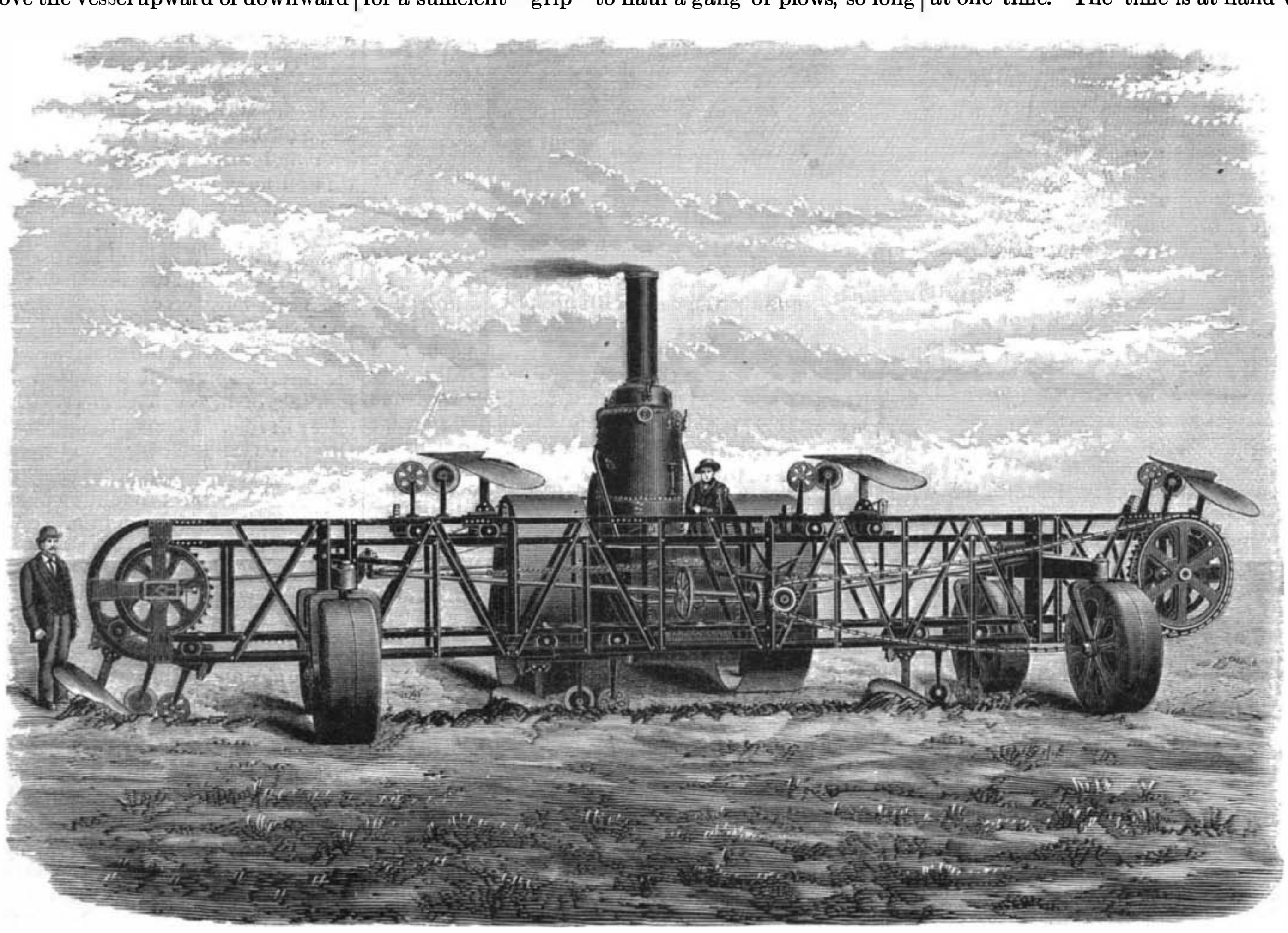
In the Ingleton system the resistance of the plows is against the side of the engine, and does not, therefore, hinder the forward move of the latter. This is the secret of its successful working; for, no matter what the condition of the land, so long as it is fit for plowing, a good traction engine, with suitable wheels, may be made to travel light. To haul a weight behind it, however, under certain conditions of soil is another question.

The main propelling wheels of the Ingleton engine are 7 feet diameter and 30 inches wide, which gives ample "grip" for propelling *itself* over any condition of land, while, owing to the width of the frame containing the plows (thirty-three feet), the engine moves forward at the rate of about half a mile per hour only, or *one-sixth* of the speed required by direct haulage, with a corresponding saving in power, fuel and water and wear and tear. Besides these advantages, it must not be forgotten that, owing to this saving of power in propelling the engine, a smaller engine will suffice to do the same amount of work than when hauling direct, for there will be found some conditions of land that it would take as much power to propel the engine over at the rate of three miles per hour as it would require to haul a gang of plows.

In the Ingleton system the plows travel through the soil eight times faster than the engine, *i. e.*, while the engine is traveling half a mile in one direction, the plows are moving at the rate of four miles per hour at right angles thereto, giving a maximum of work done to a minimum movement of engine.

The width of the plow frame may be doubled if necessary; in fact, it is recommended for large operations. This will further the advantages of this system. There is practically no fixed limit to the width of the plow frame, as each plow is mounted upon a small carriage, with four flanged wheels traveling on rails, and is independent to rise or fall, so as to follow all uneven surfaces of the land. By means of a lever placed within reach of the fireman, the main frame can be raised, and all plows taken clear of the land, with the power of the engine, and without stopping the machinery. The plows are fitted with an automatic apparatus for raising them clear of stones or roots, thus saving all damage from this source.

The main frame can be fitted with a seeder box, and Ingleton's patent harrow, so that the three operations of plowing, seeding and harrowing can be carried on at one time. The time is at hand when a good steam plow is required. It is surprising how little has been done in this direction, when we take into account the elaborate steam thrashing machine, which only deals with two or three tons weight per acre, while to plow an acre of land six inches deep one thousand tons have to be stirred, and that in a very short space of time.



INGLETON'S IMPROVED STEAM PLOW.

A Great Bridge for New York.

Modified plans have been prepared by T. C. Clarke for the North River bridge, proposed by the New York and New Jersey Bridge Company. The original plans provided for a center pier in the river, but this has been abandoned. The present design provides for a combined cantilever and suspension bridge. The river span will be 3,200 feet. The New Jersey end of the bridge will be at Miles Avenue, the New York City end at a point between the lines of Seventieth and Seventy-first Streets. A viaduct 100 feet wide, with four main tracks and three lines of sidings, will run through private property to a point between Eleventh and Twelfth Avenues, thence to a point above Thirty-eighth and Thirty-ninth Streets. A large union station will be built on the blocks between Thirty-seventh and Thirty-ninth Streets, Eighth Avenue and Broadway.

Progress of Hippophagy.

Contrary to what is commonly supposed, a very respectable number of French men and women have for a long time been eating a large quantity of horse meat, because this food agrees with their stomach as well as their purse.

In our day, the consumers of solipeds have so increased that in many places, it appears, horse meat is sold at a much higher price than it was fifteen or twenty years ago, without, however, having reached such a figure as in Denmark for a few years past, and recently in Germany. In France, hippophagy, while remaining within reach of modest purses, has made surprising progress. In several localities ordinary butchery has been seriously affected by the competition of this new trade. For example, at Toulouse, the city of France in which the largest number of horses are consumed proportionally to the number of inhabitants, the butchery syndicate has formed itself into a sort of committee against the sale of horse meat.

At Paris, the first horse butchery was opened on the 9th of July, 1866. The number of solipeds slaughtered from that epoch up to the 31st of December of the same year was only 902. It rose to 2,758 in 1869, to 65,000 during the siege and the commune, to 5,732 in 1872, and to 10,619 in 1877. The horse butcheries numbered 48 on the 1st of January, 1874, and 132 on the 1st of January, 1889. At present, the price of horse meat is nearly half that of beef for corresponding cuts. Thus a fillet of beef is sold at 2½ francs per 500 grammes, and a fillet of horse meat at 1¼ francs. The inferior cuts, which are from 40 to 60 centimes for beef, are from 20 to 30 for those of horse meat. The solipeds seized after being slaughtered, as unfit for consumption, numbered 3,583 from 1868 to 1884, that is to say for 203,537 consumed in 17 years; 304 in 1886, for 18,435 consumed; and 245 in 1887, for 16,446 consumed.

At Lyons, Bordeaux, Orleans, and Troyes and other cities the output of the horse butcheries is enormous.

According to Prof. Thomassen, of the Veterinary School of Utrecht, hippophagy is in great favor at Rotterdam. Horse meat is used there as human food to an extent that is unknown in Denmark, Sweden, and Switzerland, as well as in several parts of Italy, such as Lombardy, Piedmont, Venetia, etc.

It is extensively used in Milan, while it is scorned in Turin. In the latter city, only 55 horses were slaughtered at the abattoir in 1888. The flesh of all of these animals was used exclusively for feeding the animals of a menagerie. Mr. Manuel Prieto regrets that hippophagy is not adopted in Spain, where it would benefit numerous poor laborers, to whom ordinary meat is an article of luxury on account of its high price.

The Annual Agricultural Statistics published by the Minister of Agriculture give the number of horses, asses, and mules slaughtered for human food at Paris and in the suburbs.—*La Nature.*

Improved Propulsion and Ship Design.

Professor J. Harvard Biles, of Glasgow University, addressed the members of the Rutland Place (Glasgow) Marine Institute recently on "The Effect on Ship Design of Improvement in Means of Propulsion." Professor Biles, in the course of his lecture, compared the old time propulsion by manual power with the methods in vogue at the present time. One man, he said, on board a modern steamer with all the latest appliances at command, could produce fifteen hundred times as much work as was possible when the power was applied direct. After describing the changes which had been effected in means of propulsion, and pointing out their effect upon ship design, the lecturer proceeded to consider the possibility of propelling ships by lighter machinery and boilers of the tubular type, whose weight would be one-fifth less than at present, and in which oil would replace coal as fuel. Even with such improvements, however, it would take a vessel 1,000 feet in length and 109 feet beam, with engines of 100,000 to 120,000 indicated horse power, to cross from Queenstown to New York in four days. But remembering that in the last fifteen years the propelling power of steamers had been multiplied by six, and that in the present day 30,000 horse power was not unknown, it was not unreasonable to assume that in the next fifteen years the maximum horse power would be quadrupled.

The Magnetic Properties of Oxygen.

Commenting on Professor Dewar's recent experimental verification of the magnetic properties possessed by liquid oxygen, M. Guillaume points out, in *L'Industrie Electrique*, that if we accept the values found by Edmond Becquerel for the magnetic constant of oxygen, it ought, when in the liquid state, and in a field of medium strength, to possess a magnetic moment per cubic centimeter one-third that of iron, and a magnetic moment per gramme twice as great as that of iron; so that the strange conclusion is forced upon us that oxygen is the most magnetic of substances. M. Guillaume also points out that liquid oxygen might be made to give a faithful and delicate representation of the distribution of the lines of force in a magnetic field, the liquid being heaped up in the strong places.

A BED SPRING AND SUPPORT.

The simple and inexpensive device shown in the illustration is adapted for attachment to any ordinary bedstead rail to support the slats and form a cheap, simple and easy spring bed. It has been patented by Mr. Wilbur L. Gillette, of Yalesville, Conn. The base or support of the spring consists of a bracket, A, the wall plate of which rests against and is secured to the inner side of the rail, or the bracket may be secured in the notches where the slats are usually inserted. The main bracket arm, B, has a hole at its outer end and a notch at its inner end in which the bed spring wire is secured, the upper free end of the spring being doubled to form a keeper, C, shaped to easily receive a slat of the bed.

GILLETTE'S BED SPRING.

NOVEL TOYS.

The elasticity of torsion and tension, the storage of energy, centrifugal force, momentum and friction, are all concerned in the movement of the simple toy illustrated in Fig. 1, and yet, perhaps, not one in a thousand of the people who see the toy realizes the composite nature of its action. Barring the well known return ball, nothing can be simpler than this toy, which consists of two wooden balls of the same diameter connected by a slender elastic rubber band attached by staples, as shown in the lower figure.

To prepare the toy for operation, it is only necessary to twist the rubber band by holding one of the balls in the hand and rolling the other round in a circular

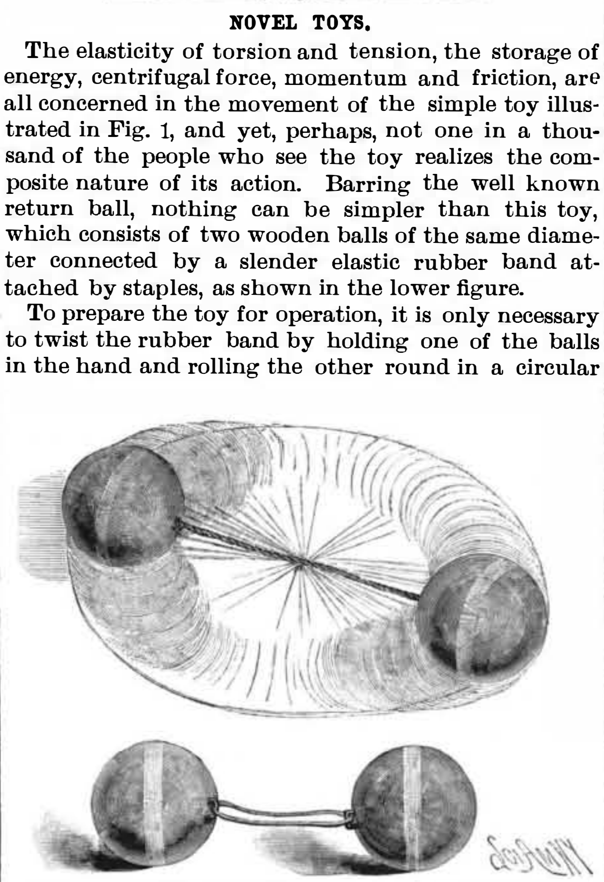


Fig. 1.—GYRATING BALLS.

path upon the floor by giving to the hand a gyratory motion. As soon as the band is twisted, the free ball is grasped in the hand, then both are released at once.

The untwisting of the rubber band causes the balls to roll in opposite directions in a circular path, and centrifugal force causes the balls to fly outwardly. By virtue of the acquired momentum, the balls continue to rotate after the rubber band is untwisted, so that the band is again twisted, but in the opposite direction. As soon as the resistance of the band overcomes the momentum of the balls, the rotation ceases for an instant, when the band again untwisting revolves the balls in the opposite direction, and the operation is repeated until the stored energy is exhausted.

In Fig. 2 is illustrated another ball in which the center of gravity is located near the periphery. The ball, which is hollow, is made of paper. To the inner

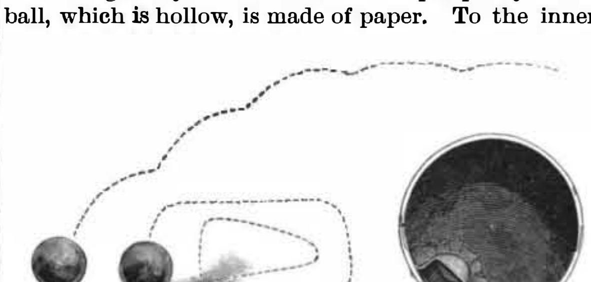


Fig. 2.—UNBALANCED BALL.

surface of the wall of the ball is attached a weight which is secured in place by a piece of cloth glued over it. When this ball is thrown through the air with a whirling motion, it describes a curve like that indicated in dotted lines in the upper part of the engraving, so that it is difficult, if not impossible, to catch it. When the ball is rolled on a plane surface, it does not take a straightforward course, as would be expected from a well-balanced ball, but its course is very erratic, as indicated in dotted lines in the lower part of the figure.

Bovines vs. Equines.

The differences anatomically and physiologically between the cattle tribe (Bos) and the horse family (Equus) is an interesting study. In parallel tables, as given in the *Maryland Farmer*, these can be seen at a glance:

CATTLE.	HORSES.
Have two toes.	Have one toe.
Horned.	Without horns.
Have no mane.	Have flowing mane.
Long hair in a tuft at end of tail.	Tail covered with long hair.
Pawing with fore feet denotes anger.	Pawing with fore feet denotes hunger.
Seize forage with the tongue.	Gather food with the lips.
Lips slightly movable.	Lips very movable.
Have no upper incisor teeth.	Have upper and lower incisors.
Lie down fore parts first.	Lie down hind parts first.
Rise on hind legs first.	Rise on fore legs first.
Short mouth. No space between incisor and molar teeth.	Mouth long. Space between front and back teeth.
Four stomachs.	One stomach.
They chew the cud.	Do not chew the cud.
Intestines small—120 feet long.	Intestines large—60 feet long.
Have gall bladder.	Have no gall bladder.
May vomit.	Do not vomit.
May breathe through the mouth.	Don't breathe through the mouth.
Mouth generally open when winded.	Mouth never open from exhaustion.
Defense by goring.	Defense by kicking.
Bellow or moo.	Neigh or whinny.
Do not sweat.	Perspire easily.
Have dewlap.	Have no dewlap.
No warts on inside of hind legs.	Hard, oval warts inside hind legs.
Never use teeth in fighting.	Use the teeth in fighting.
Do not retract the ears.	Retract the ears when angry.
Very rough tongue.	Soft, smooth tongue.
Short, broad head.	Long, narrow head.
Wide, drooping ears.	Erect, narrow ears.
Limbs formed for strength.	Limbs formed for speed.
Live twelve or eighteen years.	Live thirty or forty years.
Do not roll in the dust.	Do roll in dust.
Sleep with both ears alike.	Sleep with one ear forward.
Lie down to sleep.	Often sleep standing.
Eat and lie down to ruminate.	Never ruminate. Eat little and often.
Shoulders straight.	Shoulders sloping.

The Iron Industries thinks men who attend to the lubrication of moving machinery ought to make a study of the action of various oils upon metals more than they do. Recent experiments show the following interesting results: Iron is least affected by seal oil and most by tallow oil. Lead is least affected by olive oil and most by whale oil; whale, lard and sperm oils act to very near the same extent on lead. Brass is not affected by rape oil, least by seal oil, and most by olive oil. Tin is not affected by rape oil, least by olive oil and most by cotton seed oil. Zinc seems not to be acted upon by mineral lubricating oils, least by lard oil and most by sperm oil. Copper is not affected by mineral lubricating oils, least by lard oil and most by tallow oil. Mineral lubricating oil has no action on zinc and copper, and acts the least on brass and most on lead. Olive oil acts least on tin and most on copper. Rape oil has no action on brass and tin, acts least on iron and most on copper. Tallow oil acts least on tin and most on copper. Lard oil acts least on zinc and most on copper. Cotton seed oil acts least on lead and most on tin. Sperm oil acts least on brass and most on zinc. Whale oil has no action on tin and acts least on brass and most on lead. Seal oil acts least on brass and most on copper. From these results it will be seen that mineral lubricating oil has, on the whole, the least action on the metals employed in the experiment, and sperm oil the most. For lubricating the journals of heavy machinery, either rape oil or sperm oil is the best to use in mixture with mineral oil as they have the least effect on brass and iron, which two metals generally constitute the bearing surfaces of an engine. Tallow oil should be used as little as possible, as it has a bad effect on iron.

The Transformations of the Digger Wasps.

At a recent meeting of the Entomological Society, of Washington, Professor Riley gave a detailed description of the larva of our larger digger wasp (*Sphecius speciosus*), and drew attention to a remarkable peculiarity of the cocoon of this insect. This peculiarity consists in the presence of certain very anomalous pores which occur about the center of the cocoon and extend nearly around it. These, Professor Riley stated, must be intended for some special purpose, and probably for ventilation or respiration.

The occurrence of these pores, he stated, brings up the interesting question of the need of ventilation in the cocoons of hibernating insects, and he believed, in general, that in proportion to the imperviousness of the cocoon to air, some provision for its admission would be found.

Ticking of the Death Watch.

Mr. C. J. Gahan, at the meeting of the Entomological Society, of London, for December 2, 1891, exhibited specimens of the common book louse (*Atropos pulsatorius* Fabr.), which he had heard making a ticking noise similar to that made by the "death watch" (*Anobium*). We put this on record as corroborative evidence of the power of making such noises possessed by atropos, which many have felt doubtful of on account of its minute size and soft body covering.