

Trees for Shelter and Ornamentation.

Besides the value and importance of forest trees in many other ways, there is the shelter, beauty, and richness manifested in endless variety; and no landscape would please the taste of the man of culture and refinement without having in its composition trees of some kind. It is quite possible, and not at all uncommon, to have too many trees in the landscape, and where their distribution is in the form of lines, rows, and single trees, it is quite easy to see how the whole district may be made to assume the general appearance of a vast, irregular wood or plantation. General mixing, like general distribution of trees, is a subject which requires more attention than is generally given to it. What should be aimed at is definiteness and well defined features in all its aspects, without formality or stiffness. The trees should not be so distributed as to present an irregular, undefined, and incomprehensible mixture, either of species mixed together or in the distribution and arrangement of the trees upon the ground.

One thing that often leads to disfiguration of the landscape is the manner and form in which the planting is originally done. The great mistake here consists in not calculating to what height and proportion the trees would attain when mature and full grown. In planting shrubs or trees which bear cropping and keeping in subjection, there is little hazard or likelihood of going wrong, because in such cases the means of cure are kept in hand. If the shrub rises too high it can be headed back, and if too broad it can be reduced to the desired circumference. With medium sized trees, as the hawthorn, laburnum, mountain ash, and small leaved maple, a similar mode of treatment may be applied without prejudice.

Where the fields are small, and the whole domain of circumscribed and limited extent, the whole arrangement of distribution of the trees should be in proportion. Where the villa garden and pleasure ground are all comprised within a small area, it is often, under such circumstances, found necessary to plant medium instead of primary forest trees. By doing this the same effect is produced as by large trees in an extensive domain. Attention should also be paid to the distance the trees are planted from the garden walls, to the dwelling, or to any other object with which they might interfere when grown up.

The north and east sides of a house and premises should always be well planted, so as to afford the greatest amount of shelter, and the west and south sides left open to the sun. This in all planting, all authorities agree, should be adhered to, and the cases are extremely rare and exceptional where the rule should be departed from. The kinds or species of trees to plant have entirely to be regulated by circumstances; for the soil, situation, altitude, and climate so vary in different places that what would be suitable in one place would not at all do in another. As a general rule, in planting a new place or reorganizing an old one, it will be economy to employ a competent landscape gardener to lay out the grounds, establish the grade, and select and plant the trees and shrubbery. Much of the disappointment in country homes results from the mistakes made by the inexperienced owners in directing their improvements, and in this connection we think we may confer a favor to some of our readers needing the counsel or active services of an experienced landscape gardener by giving the address of Mr. O. C. Bullard, who resides at 123 Macon Street, Brooklyn, N. Y.

Mr. Bullard had charge of the tree planting in Prospect Park during the entire period of its construction, and his knowledge of the varieties of forest and ornamental trees is probably not surpassed by any one in this vicinity. The laying out of the grounds of Rev. Henry Ward Beecher's homestead, at Peekskill-on-the-Hudson, and the planting on his place of probably the greatest variety of ornamental trees to be found in any private grounds in the country, was the work of Mr. Bullard.

OVER \$750,000 was paid last year as duty on patent medicines in England.

SHANKS' COMPOUND ENGINE FOR SMALL VESSELS.

In the compound engine represented herewith in perspective, the use of connecting rods and guides is done away with, and a return has been made to the old arrangement of a circular eccentric sliding in a frame connected with

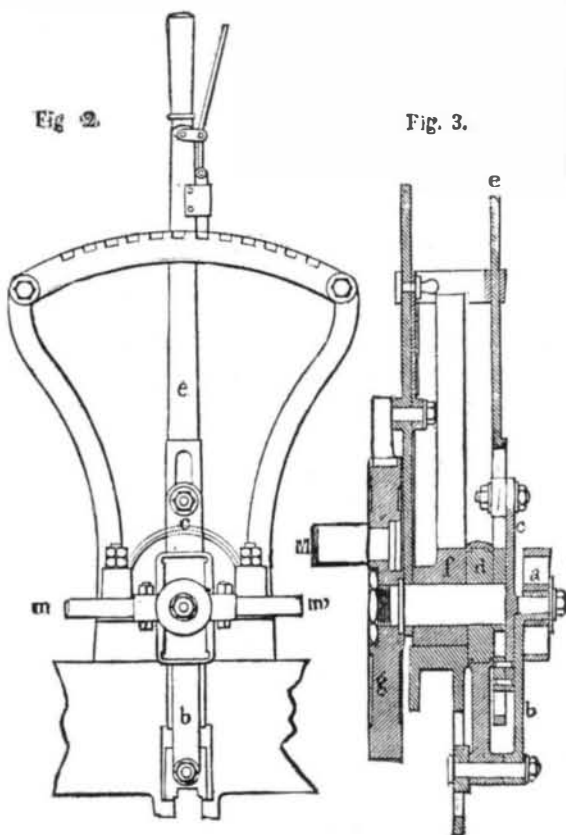


Fig. 2.—REVERSING GEAR.

the piston rods. This engine has been specially devised for small craft, and is provided with a surface condenser and a reversing mechanism. It may be seen from a simple inspection of the figure that such a type of motor is well adapted for use upon small vessels, since it is capable of developing a great power while occupying but little space. All its parts, in fact, are grouped in a very ingenious manner, and in such a way as not to interfere with ease of access to them. The cylinders, which are quite close to

two rods, m, m' , of the distributing valve are situated in a line with one another and are connected with a small vertical frame. Upon this guide there moves a slide, a , whose oblique changes in direction bring about a motion of the slide valves. To effect this, the slide is connected with a flat bar, c , which is capable of moving to and fro upon the reversing lever, e . In this latter there are slots which serve to guide the motions of the piece, c , by means of nuts placed on each side of the axis of rotation. The latter is simply screwed into a plate, g , carrying a crank pin, M . Finally, a second flat bar, b , embracing at one of its extremities the slide, a , is jointed at the other with the rod of an eccentric, d . The axis of this assemblage is prolonged behind in such a way as to enter a fixed guide contained in the frame, f . The figure represents the reversing lever held at the stop notch in the toothed sector.

It is now easy to understand that the eccentric, d , causes the bar, b , to move to and fro along the lever, e , and according to a certain angle with the direction, m, m' . Consequently the slide valves move at each stroke a distance equal to the horizontal projection comprised between the extreme points occupied by the slide, a , in its movement.

Messrs. Shanks & Son are likewise building after the same plan a series of reversible engines of all dimensions, of from six up to a thirty nominal horse power. The high pressure cylinders of the largest and smallest models have a diameter of 26 and 15 centimeters respectively, while the dimensions of the bore of the expansion cylinder vary between 56 and 33 centimeters.—*Revue Industrielle*.

Repairing the Mail Sacks.

According to Mr. H. G. Pearson, Postmaster of this city, the Government spends about \$50,000 a year for the repair of mail pouches; there are about 100,000 mail bags in use, and about 10,000 new ones are bought yearly. The weakest point in the mail sack is where it closes and opens. In closing the bag the staples are pushed through the slots, and project an inch or more. When the bag is thrown about, the staples soon bend and often break. It looks strange that this little item should cost the Government so much money, and it seems as if our inventors ought to invent a new mail bag and obviate the objection referred to in the old one.

A Suggestion to Chemists.

The low price crude coal oil sells for at present—about 63 cents a barrel, something like 20 cents a barrel, it is said, below the cost of producing it—suggests to the *Independent Record*, a newspaper devoted to oil, paint, drugs, chemicals, etc., that coal oil may be manufactured into a great variety of useful articles which our chemists have not discovered its use for yet.

This favored article, in the crude state, is worth say 60 or 70 cents per barrel. Refined, it brings five or six times that amount. Under proper and skillful treatment it yields products of greatly increased value. The *Record* counsels the discouraged men of oil to devote more time and money to the various by-products of petroleum, and less to the producing of crude and the making of refined. Bring to your assistance the chemist and the laboratory, and create from cheap oil that which it contains.

A pound of raw iron is worth a penny or two. A pound of watch springs is another thing, and the mill of the maker of raw or cheap iron may be closed and his men hungry, while the dealer in fine steel and specialties in iron is unconcerned, and his wares in constant demand. Cheap oil offers a better return to the

maker of any of the scores of petroleum's products than does crude oil at one dollar a barrel. There are specialties in the way of lubricants, petroleum jellies, paraffine wax, dyes, etc., which must enjoy a constant demand irrespective of the condition of the market for crude or refined. In the making of these will be found an employment for capital which must lift the manufacturer far above the realm occupied by the mere producer or refiner.

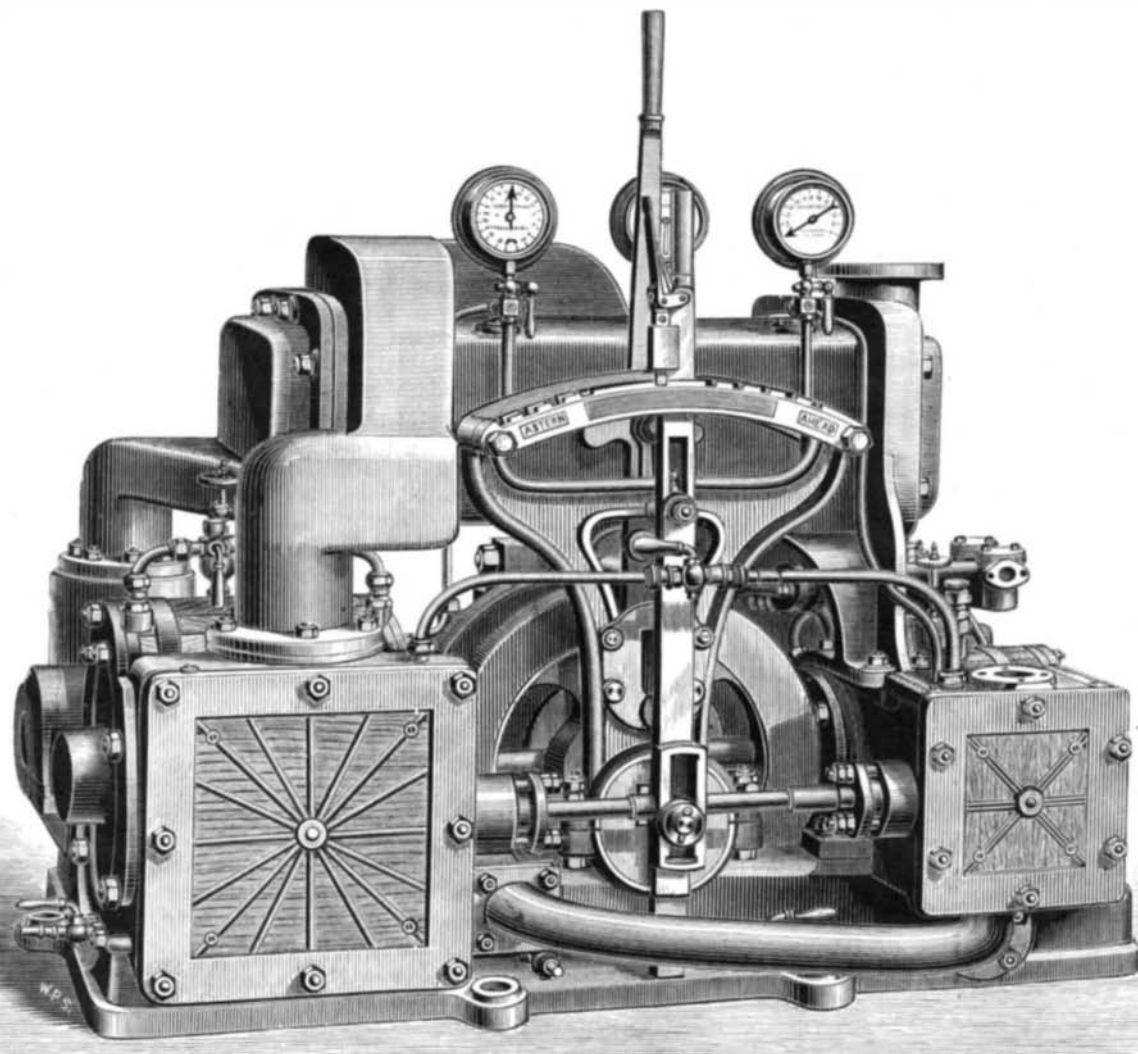


Fig. 1.—SHANKS' COMPOUND ENGINE.

one another, are connected by strong iron castings, which also carry the bearings of the driving shaft. After the steam has once operated at a high pressure, it enters the large cylinder without passing through an intermediate reservoir.

The reversing gear is particularly interesting, and for this reason we devote to it two detailed figures, one of which, in section, shows how the different parts are mounted. The

The Cocoon of a Spider.

At a recent meeting of the Academy of Natural Sciences, of Philadelphia, Dr. H. C. McCook stated that, while walking in the suburbs of Philadelphia lately, he had found under a stone a female *Lycosa*, probably *L. riparia* Hentz, which he placed in a jar partly filled with dry earth. For two days the spider remained on the surface of the soil, nearly inactive. The earth was then moistened, whereupon she immediately began to dig, continuing until she had made a cavity about one inch in depth. The top was then carefully covered over with a tolerably closely woven sheet of white spinning work, so that the spider was entirely shut in. This cavity was fortunately made against the glass side of the jar, and the movements of the inmate were thus exposed to view. Shortly after the cave was covered the spider was seen working upon a circular cushion of beautiful white silk about three-fourths of an inch in diameter, which was spun upward in a nearly perpendicular position against the earthen wall of the cave. The cushion looked so much like the cocoon of the common tube weaver, *Agalena naevia*, and the whole operations of the lycosid were so like those of that species when cocooning, that it was momentarily supposed that a mistake in determination had been made.

After the lapse of half an hour, it was found that the spider had oviposited against the central part of the cushion, and was then engaged in inclosing the hemispherical egg-mass with a silken envelope. The mode of spinning was as follows: the feet clasped the circumference of the cushion, and the body of the animal was slowly revolved; the abdomen, now greatly reduced in size by the extrusion of the eggs, was lifted up, thus drawing short loops of silk from the expanded spinnerets, which, when the abdomen was dropped again, contracted, and left a flossy curl of silk at the point of attachment. The abdomen was also swayed backward and forward, the filaments from the spinnerets following the motion as the spider turned, and thus an even thickness of silk was laid upon the eggs. The same behavior marked the spinning of the cushion, in the middle of which the eggs had been deposited. The ideas of the observer as to the cocooning habits of *Lycosa* were very much confused by an observation so opposed to the universal experience. Upon resuming the study after the lapse of an hour and a half, he was once more assured of being right by the sight of a round silken ball dangling from the apex of the spider's abdomen, held fast by a short thread to the spinnerets. The cushion, however, had disappeared. The mystery, as it had seemed, was solved; the lycosid, after having placed her eggs in the center of the silken cushion and covered them over, had gathered up the edges, and so united and rolled them as to make the normal globular cocoon of her genus, which she at once tucked under her abdomen in the usual way.

This was a most interesting observation, which Dr. McCook believed had not before been made. The manner of fabrication of the cocoon of *Lycosa* had been heretofore unknown to him, and, by reason of her subterranean habit, the opportunity to observe it was of rare occurrence. He had often wondered how the round egg-ball was put together, and the mechanical ingenuity and simplicity of the method were now apparent. The period consumed in the whole act of cocooning was less than four hours; the act of ovipositing took less than half an hour. Shortly after the egg-sac was finished, the mother cut her way out of the silken cover. She had evidently thus secluded herself for the purpose of spinning her cocoon.

Dr. McCook also alluded to another interesting fact in the life history of the *Lycosa*, which had been brought to his attention by Mr. Alan Gentry. A slab of ice having been cut from the frozen surface of a pond about eight or ten feet from the bank, several spiders were observed running about in the water. They were passing underneath the surface, between certain water plants. It is remarkable to find these creatures thus living in full health and activity in mid-winter, within the waters of a frozen pond, and so far from the bank in which the burrows of their congeners are commonly found. It has been believed heretofore, and doubtless it is generally true, that the lycosids winter in deep burrows in the ground, sealed up tightly to maintain a higher temperature.

Golden Streets.

The well known French electrician, M. Louis Maiche, has found that there is gold to be obtained from the quartz with which the roadsround Paris are paved. M. Maiche has extracted small quantities of the precious metal by crushing the stone and treating it with mercury. We have not yet heard of the formation of a company for working the streets of Paris to obtain this gold, nor do we suppose that there will be much of a rush for the new "diggings."

EVEN delirium tremens is now traced to a micrococcus: "the worm of the still."

ELECTRICITY WITHOUT APPARATUS.

(1) To produce an electric spark, it is only necessary to warm a sheet of ordinary paper in front of a good fire or stove or over a lamp. Upon going into a dark place and applying the knuckle to the paper a very decided spark will start from the latter, accompanied by a slight crackling sound.

(2) Take two sheets of paper and interpose a sheet of gold-leaf between them. After electrifying them as above described, it will be only necessary to pass a pencil point in a

**AN ELECTRIC SPARK FROM A SHEET OF PAPER.**

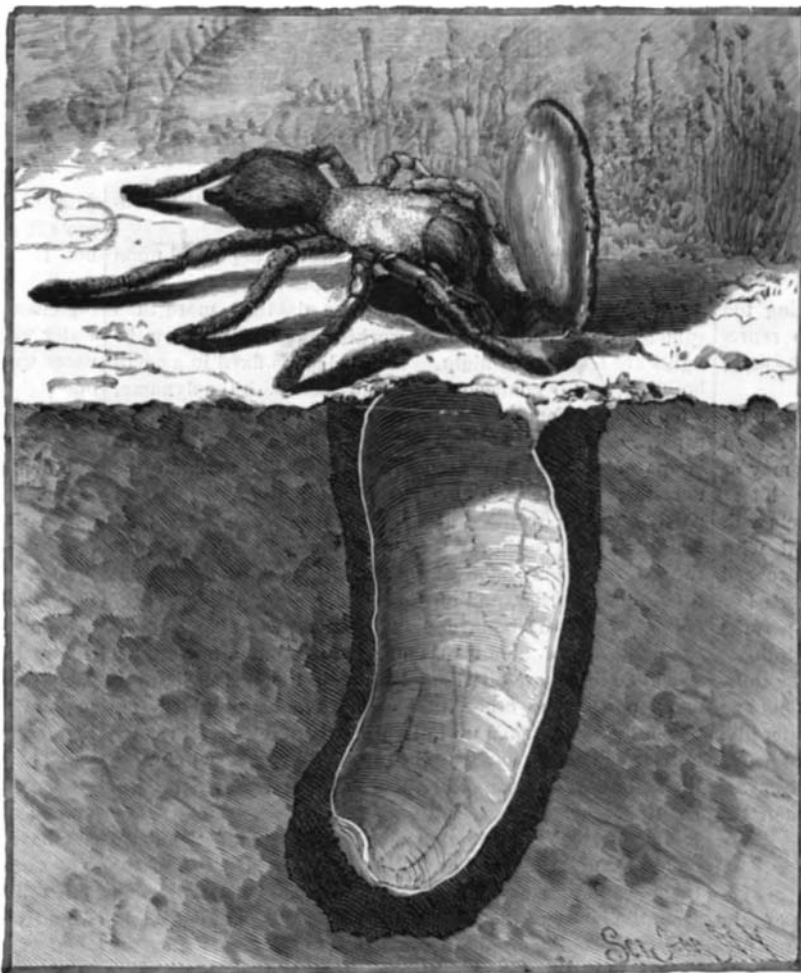
zigzag manner over their surface to cause the appearance thereon of a luminous flash of considerable intensity.

These experiments, which are very easy to perform, may serve to demonstrate the fundamental rules of static electricity to children.

Fireproof Paper.

A fireproof paper is made by a combination of asbestos and infusorial earth.

About forty parts, in bulk, of fine or disintegrated asbestos fiber and about sixty parts of what is known as "infusorial earth" are taken and placed in a dry state in an ordinary beating engine, and then sufficient water is added while the machine is in operation to beat the mass into pulp just thin enough to form upon an ordinary cylinder. The web is taken from the cylinder and finished in the usual manner. The asbestos fiber is long enough to give strength and elasticity to the paper, and the infusorial earth, which is a good non-conductor of heat, and fireproof, forms a filler or padding, the two adhering together strongly and forming a flexible paper, which may be used wherever or-

**THE TARANTULA OF SOUTHERN CALIFORNIA.**

inary paper board is employed, it differing, however, from ordinary board in being fireproof.

The infusorial earth should be calcined before use to free it from impurities not fireproof.

If desired, and in some instances, a small quantity of lime, starch, or other cementitious substance is added. The proportion of asbestos and infusorial earth may be varied.

THE TARANTULA OF SOUTHERN CALIFORNIA.

Ugly, vicious, energetic, and to a certain degree poisonous, are the spiders that infest the southern part of California, and yet when closely studied they present many peculiar characteristics, both in regard to their structure and habits. Among the most valued trophies tourists carry away with them from the coast are neat cards adorned with these animals, and a case containing the nest so arranged as to show its wonderful trap door and the delicate lining of the interior. The adobe rauches are full of these strange little habitations, and some of the sunny valleys among the foot hills are literally strewn with the small tunnels, capped with the almost invisible door. Our engraving shows the tarantula (*Mygale hentzi*) as he is about to enter his abode, both being full size.

The general appearance of the tarantula is very clearly shown in the engraving. The legs are larger, and are not furnished with so long and dense a growth of hair as are the specimens found in other sections of the Southwestern States. The back is covered very thickly with extremely fine short hair; the back and the outer joints of the legs are of a light brown color, the remainder being of a deeper shade. The forward part of the head is divided, and each division terminates in a sharp, downwardly curved, and jet black horn or hook.

The tarantula pounces upon his prey, and thrusting in the hooks most securely holds his victim. It is seldom met in the daytime, preferring to seek its food during the night, returning to its nest in the early morning. Although pugnacious when cornered, he will not seek a fight, and is more anxious to escape than the stranger whom he chances to meet.

This tarantula is justly celebrated for the architectural skill he displays and for the luxurious comfort of his dwelling. Having selected a suitable site, he digs a hole varying from four to eighteen inches in depth, and just large enough around to admit him easily, although it is puzzling to conceive how he ever gets his long, ungainly, and many jointed legs comfortably disposed in so small a space.

The walls are carefully smoothed, and are completely covered with an exceedingly fine fabric of his own manufacture. The top of this tunnel is slightly flared, and in this widened part is fitted the door, which is hinged at one side so that it may be easily lifted. The inside of the door is finely finished, and covered with a web similar to that on the sides. The tarantula knows that this door is not heavy enough to insure a tight fit when it is dropped, so he makes a small handle near the center of the under side by which he pulls the door closely down, thereby insuring a joint that most effectually excludes all dampness from his abode. The handle is a strong web, the two ends of which are attached to the door at points about one-sixteenth of an inch apart. The outside of the door is placed about at the level of the ground, and is so nearly the same color as the surrounding soil that it can be discovered only after the most careful search. The

joint of the door is so well made and the colors are so nearly alike that it is almost impossible to ascertain upon which side the hinge is placed, except by raising the door. The framing of the door seems to be a coarse, strong web, which is extended at one side to form the hinge, and which is bonded with earth to give it the requisite stiffness. The hinge is about three-eighths of an inch wide, and acts as a spring to shut the door immediately after the owner's exit. For the tarantula and nest from which our engraving was made, we are indebted to the courtesy of Mr. H. J. Finger, of Santa Barbara, Cal.

Preparation of Aluminum.

According to an account which the SCIENTIFIC AMERICAN finds in *Chemiker Zeitung*, ferro-silicium is mixed with fluoride of aluminum in equal proportions, and the mixture is exposed to a fusing heat. The materials decompose each other, and volatile fluosilicium with iron and aluminum are produced, the latter two bodies being alloyed together. In order to extract the valuable aluminum, a copper alloy is formed by melting the iron alloy with metallic copper; by reason of the greater affinity of the copper for aluminum this is secured, leaving with the iron only a slight residue of aluminum. When the fused mass is cold, copper bronze and iron have so settled that both bodies can be easily separated. In place of the pure fluoride of aluminum, chloride can be used, when chlorosilicium and iron aluminum alloy are formed. If in practice the chemical reactions above outlined are found to hold true, this patented process promises to be of considerable value.

LARGE fortunes are rare in Switzerland, and the salaries of public functionaries very modest. The President of the Confederation receives \$3,000 a year, few judges more than \$1,250, and there is probably no bank manager in the country who gets more than twice that amount. A man with an income of \$2,500 is considered very well off indeed, and to have \$5,000 is to be rich.