

AMATEUR MECHANICS.

A SIMPLE SINGLE-ACTING STEAM ENGINE.

The great bugbear staring the amateur mechanic in the face when he contemplates making a small steam engine is the matter of boring the cylinder. To bore an iron cylinder on a foot lathe is difficult even when the lathe is provided with automatic feed gear, and it is almost impossible with the ordinary light lathe possessed by most amateurs. To bore a brass cylinder is easier, but even this is difficult, and the cylinder, when done, is unsatisfactory on account of the difficulty of adapting a durable piston to it.

The engravings show a simple steam engine, which requires no difficult lathe work; in fact the whole of the work may be done on a very ordinary foot lathe. The engine is necessarily single-acting, but it is effective nevertheless, being about 1-20 H. P., with suitable steam supply. It is of sufficient size to run a foot lathe, scroll saw, or two or three sewing machines.

The cylinder and piston are made from mandrel drawn brass tubing, which may be purchased in any desired quantity in New York city. The fittings are mostly of brass, that being an easy metal to work.

The principal dimensions of the engine are as follows:

Cylinder.—Internal diameter, $1\frac{1}{4}$ in.; thickness, $\frac{1}{8}$ in.; length, $3\frac{3}{4}$ in.

Piston.—External diameter, $1\frac{1}{4}$ in.; thickness, $3\text{--}32$ in.; length, $3\frac{3}{4}$ in.

Length of stroke, 2 in.

Crank pin.—Diameter, $\frac{1}{4}$ in.; length of bearing surface, $\frac{1}{2}$ in.

Connecting rod.—Diameter, $5\text{--}16$ in.; length between centers, $5\frac{1}{2}$ in.

Shaft.—Diameter, $\frac{3}{8}$ in.; diameter of bearings, $\frac{1}{2}$ in.; length, 6 in.; distance from bed to center of shaft, $1\frac{1}{2}$ in.

Flywheel.—Diameter, 8 in.; weight, 10 lb.

Valve.—Diameter of chamber, $9\text{--}16$ in.; length, $1\frac{1}{4}$ in.; width of valve face working over supply port, $3\text{--}32$ in.; width of space under valve, $\frac{3}{8}$ in.; length of the same, 1 in.; distance from center of valve spindle to center of eccentric rod pin, $\frac{3}{4}$ in.

Ports, supply.—Width, $1\text{--}16$ in.; length, 1 in. Exhaust.—Width, $\frac{1}{2}$ in.; length, 1 in.; space between ports, $5\text{--}16$ in.

Pipes.—Steam supply, $\frac{1}{4}$ in.; exhaust, $\frac{3}{8}$ in.

Eccentric.—Stroke, $\frac{3}{8}$ in.; diameter, $1\text{--}5\text{--}16$ in.

length of eccentric rod between centers, $8\frac{3}{4}$ in.

Cut-off, $\frac{3}{8}$

Thickness of base plate, $\frac{1}{4}$ in.

Wooden base, $6\frac{1}{4}$ in. x 8 in.; $2\frac{1}{2}$ in. thick.

Thickness of plate supporting cylinder, $\frac{3}{4}$ in.

Total height of engine, $13\frac{1}{4}$ in.

Distance from base plate to under side of cylinder head, $9\frac{1}{4}$ in.

Diameter of vertical posts, $9\text{--}16$ in.; distance apart, $3\frac{3}{4}$ in.; length between shoulders, $6\frac{1}{4}$ in.

Base plate fastened to base with $\frac{1}{4}$ in. bolts.

The connecting rod, eccentric rod, crank pin, and shaft, are of steel. The eccentric-strap and flywheel are cast iron, and the other portions of the engine are of brass. The screw threads are all chased, and the flange, *a*, and head of the piston, *F*, in addition to being screwed, are further secured by soft solder.

Fig. 1 shows the engine in perspective. Fig. 2 is a side elevation, with parts broken away. Fig. 3 is a vertical transverse section. Fig. 4 is a partial plan view. Fig. 5 is a detail view of the upper end of the connecting rod and its connections; and Fig. 6 is a horizontal section taken through the middle of the valve chamber.

The cylinder, *A*, is threaded externally for 1 inch from its lower end, and the collar, *a*, $\frac{1}{4}$ inch thick, is screwed on and soldered. The face of the collar is afterward turned true. The same thread answers for the nut which clamps the cylinder in the plate, *B*, and for the gland, *b*, of the stuffing box, which screws over the beveled end of the cylinder, and contains fibrous packing filled with asbestos or graphite. The posts, *C*, are shouldered at the ends and secured in their places by nuts. Their bearing surface on the plate, *D*, is increased by the addition of a collar screwed on. The posts are made from drawn rods of brass, and need no turning except at the ends.

The cylinder head, *E*, which is a casting containing the valve chamber, is screwed in. The piston, *F*, fits the cylinder closely, but not necessarily steam tight. The head is screwed in and soldered, and the yoke, *G*, which receives the connecting rod pin, is screwed into the head. The connecting rod, *H*, is of

steel with brass ends. The lower end, which receives the crank pin, is split, and provided with a tangent screw for taking up wear. The crank pin is secured in the crank disk, *I*, by a nut on the back. The eccentric rod, *J*, is of steel, screwed at its lower end into an eccentric strap of cast or wrought iron, which surrounds the eccentric, *K*.

The valve, *L*, is slotted in the back to receive the valve spindle, by which it is oscillated. The ports are formed by

It is desirable to construct a flat pasteboard model to verify measurements and to get the proper adjustment of the valve before beginning the engine. M.

MISCELLANEOUS INVENTIONS.

An improved finger ring has been patented by Mr. David Untermeyer, of New York city. The object of this invention is to furnish finger rings so constructed that they can be opened out to represent serpents, and which, when being worn, will give no indication of being anything more than rings.

An improved heel skate-fastener has been patented by Mr. Elijah S. Coon, of Watertown, N. Y. This invention consists, essentially, of a screw-threaded hollow plug or thimble, a dirt plate for covering the opening in the plug, and a spring for holding the dirt plate in place. This fastener possesses several advantages over one that is permanently attached to the heel. Being cylindrical, it is more easily connected, because the hole for its reception can be made with a common auger or bit without the necessity for last- ing the boot or shoe or using a knife or chisel. Being screw threaded it can be readily screwed into place with a common screwdriver; this also enables it to be screwed either in or out, in order to make it fit the heel key. The screw thread permits of screwing it in beyond the surface of the heel, so as to prevent it from wearing out by the ordinary wearing of the shoe.

An improved velocipede has been patented by Messrs. Charles E. Tripler and William H. Roff, of New York city. The object of this invention is to obtain a more advantageous application of the propelling power than the ordinary cranks, to avoid the noise of pawls and ratchets, and to guard the velocipedes against being overturned should one of the rear wheels pass over an obstruction.

Mr. Philip H. Paxon, of Camden, N. J., has patented a machine that will cut lozenges in a perfect manner, and will not be clogged by the gum and sugar of the lozenge dough.

Mr. John H. Robertson, of New York city, has patented an improved mat, which consists of longitudinal metal bars provided with alternate mortised and tenoned ends, and composed of series of sockets united by webs and of wooden transverse rods entered through said sockets and held therein by vertical pins.

Mr. Charles F. Clapp, of Ripon, Wis., has patented a novel arrangement of a desk attachment for trunks. The desk and tray may be lifted from the trunk when the desk is either raised or lowered.

A combined scraper, chopper, and dirter has been patented by Messrs. Francis A. Hall and Nathaniel B. Milton, of Monroe, La. The object of this invention is to furnish an implement so constructed as to bar off a row of plants, chop the plants to a stand, and dirt the plants at one passage along the row, and which shall be simple, convenient, and reliable.

Mr. Hermann H. Cammann, of New York city, has patented a basket so constructed that it can be compactly folded for transportation or storage.

Messrs. David H. Seymour and Henry R. A. Boys, of Barrie, Ontario, Canada, have patented an improvement in that class of devices that are designed to be applied to steam cylinders for introducing oil or tallow into the cylinder and upon the cylinder valves. It consists of an oil cup provided with a gas escape, a scum breaker, an interior gauge, and an adjustable feed pipe extension.

Mr. John H. Conrad, of Charlotte, Mich., has patented a portable sliding gate which will dispense with hinges and which can be used in any width of opening. It may be readily connected with a temporary opening or gap made in the fence.

An improved reversible pole and shaft for vehicles has been patented by Mr. Francis M. Heuett, of Jug Tavern, Ga. The object of this invention is to so combine the parts of shafts for vehicles that they may be readily transposed and re-employed to form the tongue without removing the thill arms or hounds from the axle.

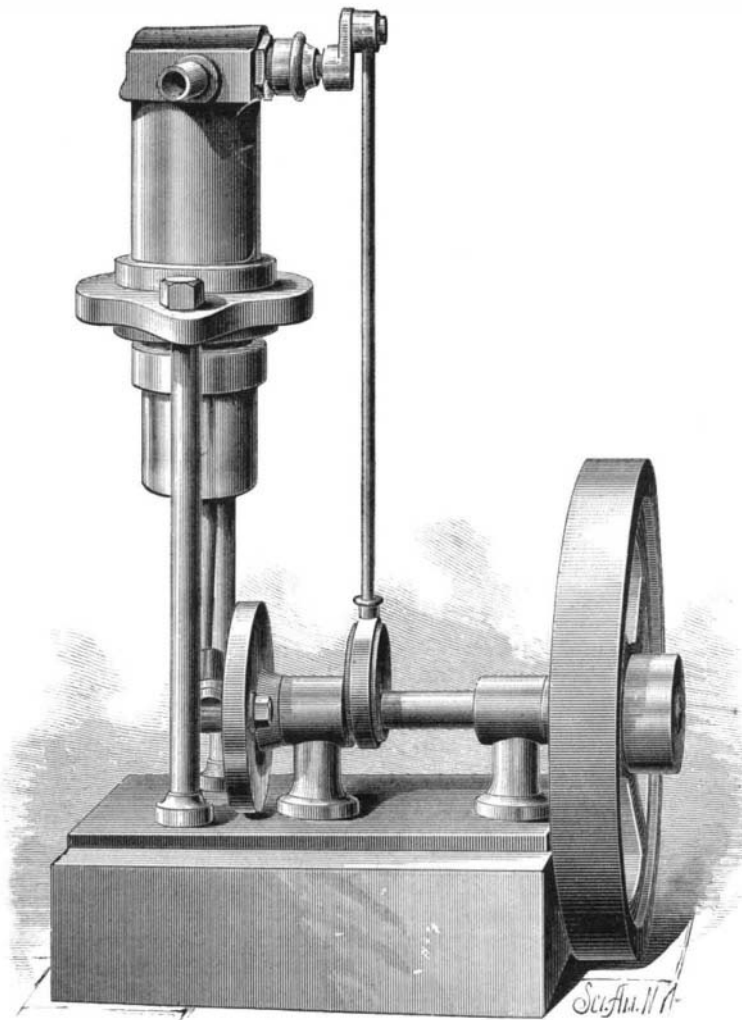
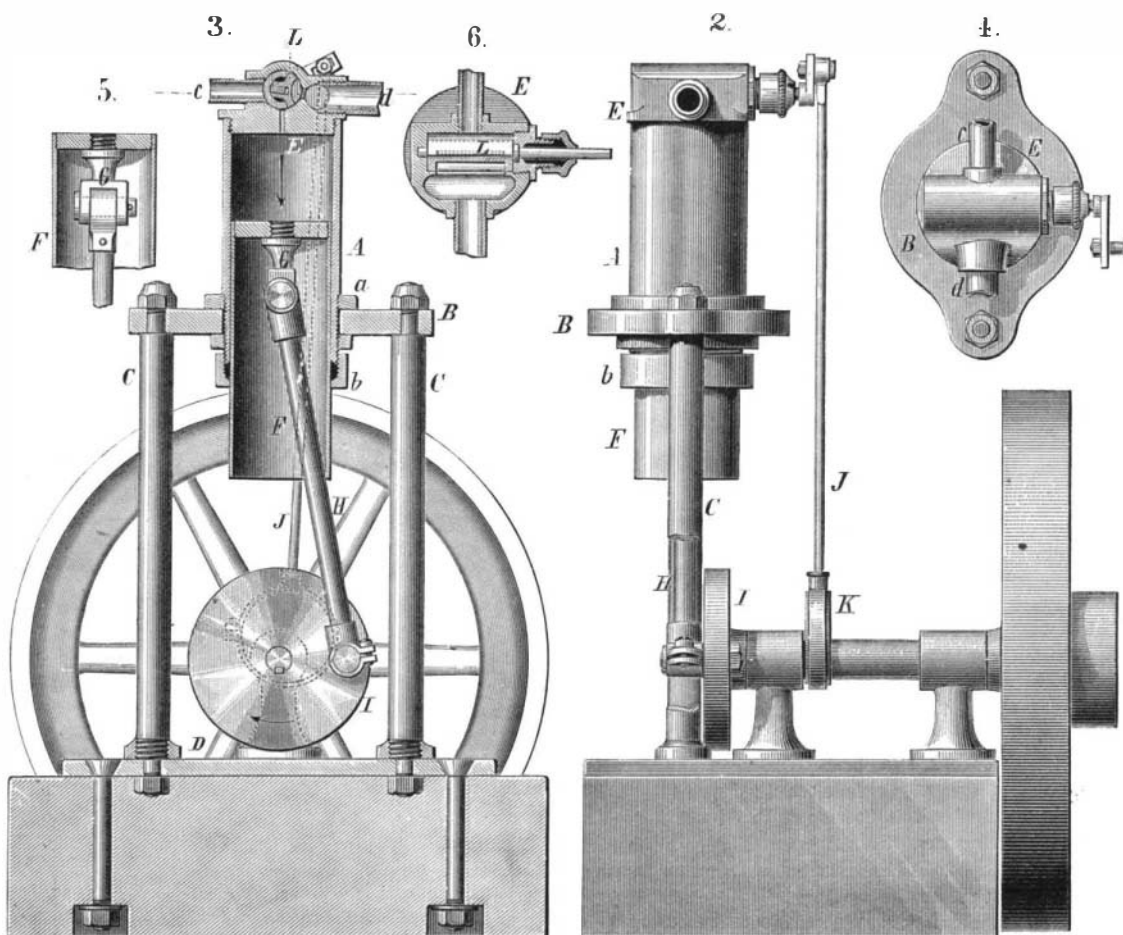


Fig. 1.—SIMPLE SINGLE-ACTING STEAM ENGINE.

drilling from the outside, and afterward forming the slot with a graver or small sharp chisel. The supply port, for convenience, may be somewhat enlarged below. The holes for the exhaust port will be drilled through the hole into which the exhaust pipe is screwed. The chamber communicating with the exhaust is cored out in the casting.

The easiest way to make the valve is to cut it out of a solid cylinder turned to fit the valve chamber.

An engine of this kind will work well under a steam pressure of 50 lb., and it may be run at the rate of 200 to 250 revolutions per minute.



SIDE ELEVATION, SECTIONAL, AND DETAIL VIEWS OF SIMPLE ENGINE.

Mr. William Jones, of Kalamazoo, Mich., has patented an improved box which is useful for various purposes, but is particularly intended for shipping fourth class mail matter. The feature of special novelty is the means of fastening the hinged cover.

Mr. Louis J. Halbert, of Brooklyn, N. Y., has patented an improved slate cleaner, which is simple, convenient, and effective.

An improved boot, which is simple in its make, fits well, and is convenient to put on and take off, has been patented by Ellene A. Bailey, of St. Charles, Mo. The boot is provided with side seams, one of which is open at its lower end, and is provided with lacing, buttons, or a like device, so that it can be closed when the boot is on the wearer's foot.

THE HERCULES BEETLE.

In the handsome engraving herewith are shown the male and female of the Hercules beetle (*Dynastes hercules*) of Brazil. The family of the *Dynastidae* comprises some of the largest and most beautiful of the beetle race, and all of them are remarkable for enormous developments of the thorax and head. They are all large bodied and stout limbed, and by their great strength abundantly justify their generic name, *Dynastes*, which is from the Greek and signifies *powerful*. The larvæ of these beetles inhabit and feed upon decaying trees and other rotting vegetable matter, and correspond in size with the mature insects. Most of them inhabit tropical regions, where they perform a valuable service in hastening the destruction of dead or fallen timber.

An admirable example of this family of beetles is the one here represented. In the male of the Hercules beetle the upper part of the thorax is prolonged into a single, downward curving horn fully three inches long, the entire length of the insect being about six inches. The head is prolonged into a similar horn, which curves upward, giving the head and thorax the appearance of two enormous jaws, resembling the claw of a lobster. The real jaws of the insect are underneath the lower horn, which projects from the forepart of the head. The under surface of the thorax-horn carries a ridge of stiff, short, golden-yellow hairs, and the under surface and edges of the abdomen are similarly ornamented.

The head, thorax, and legs are shining black; the elytra, or wing-covers, are olive-green, dotted with black spots, and are much wrinkled. The wings are large and powerful.

The female Hercules is quite unlike the male. It is much smaller, being not more than three and a half inches long, is without horns, and is covered with a brown hairy felt.

These beetles are nocturnal in habit, and are rarely seen in the daytime, except in dark hiding places in the recesses of Brazilian forests.

A Poulterer's View of Mechanical Poultry Raising.

A prominent dealer in poultry, Mr. H. W. Knapp, of Washington Market, gives a discouraging opinion of the probable success of chicken raising by artificial means in this country. He said recently when questioned on this subject by a representative of the *Evening Post*:

"I went to France to study the matter, for if it can be made to succeed it will make an immense fortune, as it has already done in Paris. I was delighted with what I saw there, and the matter at first sight seems to be so fascinating that I do not wonder that new men here are always ready to take hold of it as soon as those who have bought dear experience are only too glad to get out of it. Even clergymen and actors are bitten with the desire to transform so many pounds of corn into so many pounds of spring chicken. The now successful manager, Mackaye, spent about a thousand dollars in constructing hatching machines and artificial mothers in Connecticut, but he found that the stage paid better, and his expensive devices may now be bought for the value of old tin.

"Enthusiasts will tell you that by the new discovery

chickens may be made out of corn with absolute certainty. In Paris this has been done; but the conditions are entirely different here. There the land is valuable, and they cannot devote large fields to a few hundred chickens; the French climate is so uniform that the markets of Paris cannot be supplied from the south with produce which ripens or matures before that of the neighborhood of Paris; the price of chickens is so high and labor so cheap that more care can be given with profit to one spring chicken than one of our poultry raisers could give to a dozen. Here we have plenty of land, the climate south of us is so far advanced in warmth that even with steam we cannot raise poultry ahead of the south, and the margin of profit is so small that one failure with a large batch of chickens sweeps away the profits from several successful experiments.

"When persons wanted me to go into the project I declined and was called an old fogey. One man spent a fortune on the enterprise in New Jersey, and at first was hailed as a public benefactor. What was the result of all his outlay

astrosly than the chicken business. Size and weight are wanted in turkeys; and that reminds me," continued Mr. Knapp, "that the newspapers ought to impress the country people with the necessity of improving their poultry stock; breeding in and in is ruining poultry; every year the stock we receive is deteriorating, and this is the cause. I could give you some striking examples from my experience of forty years in the business. Some years ago we poulterers thought that ducks were going to disappear from bills of fare altogether; they were tasteless, worthless birds which people avoided. On Long Island a farmer made experiments in breeding with an old Muscovy drake, tough as an alligator, and the common duck. The result was superb and has changed the whole duck industry. If the farmers of Southern New Jersey, the sandy country best suited to turkeys, would bring from the West a few hundred wild turkeys we should have an immediate improvement. I see no such turkey now as we had twenty years ago. The breast is narrow and the body runs to length; it is all neck and legs, and can be bought by the yard. Rhode Island sends us the best turkeys, but they are not what they used to be. If, instead of attempting to beat nature at her own game, the rich men who have money to spend would devote it to better breeding, there would be an improvement. I do not yet despair of seeing immense farms wholly devoted to raising better poultry than we yet have."

The Embrace of the Mantis.

Mr. Addison Ellsworth favors us with a transcript of a letter from Mr. Albert D. Rust, of Ennis, Ellis County, Texas, describing a remarkable exhibition of copulative cannibalism on the part of the mantis. The ferocious nature of these strange insects is well known, and is in striking contrast with the popular name, "praying mantis," which they have gained by the pious attitude they take while watching for the flies and other insects which they feed upon.

About sunrise, August 28, 1880, Mr. Rust's attention was attracted by a pair of mantis, whether *Mantis religiosa* or not, he was not sure, but from the length of the body and the shortness of the wings he was inclined to think them of some other species. The female had her arms tightly clasped around the head of the male, while his left arm was around her neck. Mr. Rust watched intently to see whether the embrace was one of war or for copulation. It proved to be both. As the two abdomens began to approach each other the female made a ferocious attack upon the male, greedily devouring his head, a part of the body, and all the arm that had encircled her neck. A moment after the eating began, Mr. Rust observed a complete union of the sexual organs, and the eating and copulation went on together. On being forcibly separated the female exhibited signs of fear at her headless mate, and it was with difficulty that they were brought together again. On being suddenly tossed upon the back of the female the male seized her with a grasp from



THE HERCULES BEETLE.

and work? He managed to hatch quantities of young chickens every February, but although he could fatten them by placing them in boxes and forcing a fattening mixture down their throats, he could not make them grow; they had no exercise; they remained puny little things, and another defect soon appeared: though fat they were tough and stringy. The breeder sent lots of them to me, and they looked fat and tender; but my customers complained that they could not be young, for they were tough and tasteless, and that I must have sold them aged dwarfs under the name of spring chickens. It was found absolutely necessary to let them run out of doors as soon as the weather allowed it, and by the time that they were ready for market the southern chickens were here and could be sold for less than these. The upshot of the business is that this breeder has sold out, and another man has now taken hold of a small part of his old establishment to try other methods of making it a success.

"As to raising turkeys in that manner it will fail more dis-

which she could not extricate herself, and immediately the sexual union was renewed, to all appearances as perfectly as before.

The pair were accidentally killed, otherwise, Mr. Rust thinks, the female would have continued her cannibalistic repast until she had devoured the entire body of her companion.

This peculiarity of the mantis seems not to have been observed before, though their mutually destructive disposition has been noted by several. Desiring to study the development of these insects, M. Roesel raised a brood of them from a bag of eggs. Though plentifully supplied with flies, the young mantis fought each other constantly, the stronger devouring the weaker, until but one was left.

M. Poiret was not more successful. When a pair of mantis were put together in a glass they fought viciously, the fight ending with the decapitation of the male and his being eaten by the female.