Scientific Items.

ROTARY STEAM ENGINES.

We illustrate in the accompanying plate from "Knight's American Mechanical Dictionary," a series of views of rotary engines, which will be useful for reference to many of our mechanical readers who have not the advantage of an encyclopedia for consultation. We give the plate and accompanying explanations by special request.

A rotary engine is one in which the piston rotates in the cylinder, or the cylinder upon the piston. The varieties of engines of this class are numerous, comprising engines with one, two, three and four on single axes; pistons working in pairs on several axes; wheels driven by steam injected against them, or working by reaction, emitting steam longitudinally. Engines of this class was first suggested by inventors and introduced about the beginning of the present century.

The annexed plate shows quite a variety of forms of this class of machines which will be understood from the following descriptions: *a* has a single piston keyed to the hub, and rotating in an annular chamber, which has the functions of a cylinder. In the middle, on the right, is the abutment, which slides radially to allow the piston to pass. Above and below the abutment respectively are the induction and eduction ports.

b, Has a single piston which passes a crescent-shaped rocking abutment situated between the induction and eduction ports.

c The piston revolves on a hub concentric with the cylinder, and the annular steam space between the hub and cylinder side is traversed on each side alternately by sliding abutments, connected together and operated by a segmental cam on the piston shaft which impinges against anti-friction rollers of the frame.

d, The steam issues from the piston at * and is educted at +, passages being provided through the tubular shaft. The abutments swing out of the way, for the passage of the piston, being actuated by connected rods and levers operated by a cam on the main shaft.

e The piston wheel is arranged eccentrically within the cylinder, and has two buckets, which are expanded radially by springs, and withdrawn to pass the abutment by contact with the cylinder. Packing segments on the piston wheel and the edges of the buckets confine the steam.

f, Has an elliptical piston the working faces of which are expansible by screws to pack it against the side of the annular chamber in which it revolves. It has a rocking abutment, which oscillates in a chamber.

g, Has two pistons, with vibrating abutments, which retract into recesses to allow the pistons to pass.

h, The pistons are situated upon the extremities of the hollow arms. The steam ports in the hub of the main shaft serve as induction passages for the steam, the eduction ports being located upon the periphery of the enclosing case of the engine. The steam is admitted to a chamber in the shaft through a pipe which revolves therewith.

j, Has three pistons, which has a certain freedom of motion in seats in the inner cylinder, which rotates in an eccentric drum.

k, Has three pistons on a wheel keyed to the main shaft. Inclines on the advancing faces of the piston push back the swinging abutments which then closed the eduction. The induction ports are above and below.

l, Has three pistons, two valve abutments, and two induction and eduction ports.

m, Has three pistons on one shaft, set at angles of 120°. Steam admitted at one side of the casing, and departing at the other, presses against a flexible band, which drives the pistons before it.

n, The eccentric hub revolves in the annular cylinder, and has pistons arranged on yokes, traversing at right angles to each other and provided at their ends with spring packing plates, which accommodates themselves to the interior surface of the cylinder. The induction openings are also covered with flexible plates, which accommodate themselves to the surface of the hub and permit the passage of the piston. The engine runs in either direction, and exhausts at the bottom.

o, Has also diametric pistons which are equal to the diameter of the casing, and slip to and fro in slots in the eccentric hub.

p, Has four distinct pistons, which slip in and out in radial slots in the circumference of the eccentric hub. Steam is admitted and educted by flexible pipes. The abutment, as in the last two mentioned, is formed by the contact of the hub with the inside of the cylinder.

q, In the Scheutz (a Swedish) engine. Its hub and cylinder are eccentric, and the abutments are formed by double inclines, which force in the pistons as they come in contact therewith. Steam is introduced and discharged at ports leading through the inclines on the respective sides of the abutments.

r r', Has two pair of pistons, each attached to a core, which occupies but half the length of the cylinder in the direction of its axis. Each pair of pistons is thus attached to its own core for only half the pistons length, while the other half projects over the core belonging to the other pair. Neither pair of pistons can therefore, pass the other, though they may come into contact.

s s' s'' Are three views of an American engine (Behren's). The views show three positions of the pistons, which work in opposition. It has two cylinders, the spaces of which overlap each other, and in the centre of each is a solid cylindrical core. Each piston is firmly attached to an axis, and is part of a solid ring fitting to the core and to the interior of the cylinder. The axes are externally connected to gear wheels, to ensure simultaneous and equal action.

t, Is the Pillner & Hill engine (English), with two cylinders, overlapping chambers, and two systems of rotary pistons which may be compared to cog wheels. These wheels by the close contact of their cogs prevent the passage of steam between them, and they are adapted steam-tight to the interior of their cylinders by metallic packing to the tips of their teeth; *u* is a somewhat similar form; and in *v* a jet of steam is forced against the vanes of a wheel as they are presented in turn in a steam-tight case:

The above by no means includes all the multifarious forms of rotary engines, since the name is legion; but the description will fairly illustrate the more pronounced types of this class of machines.

DESCRIBING LINES ON BRIGHT SURFACES.—Many workmen find it somewhat difficult to describe the pattern of work upon iron or steel, especially after the surface is finished. Yet it is necessary to have an outline of the intended form. For instance, if a pattern of a hammer for a revolver be required to be made on a piece of iron or steel that has been faced down, the general practice would be to drill the hole for the screw or pin on which it turns, then fasten the pattern to the work by driving a piece of wire in the hole, and with a scribner mark around the pattern which is then removed and the work filed away to this line. To obtain a more permanent line and one that will show very distinctly in all its tracings, coat the surface on which the line is to be made with a film of copper. To do this take a lump of sulphate of copper sometimes called bluestone, wet it with water and rub over the bright surface of the work. the moisture will dry in a few minutes, when the pattern may be put in place and the outline described. The line will be clear and show very distinctly through the coppery surface. Three or four light rubs with the sulphates are sufficient to produce this surface, which is so very thin that it may be easily removed, when the work is done, with a fine file, or by rubbing with a bit of emery cloth.—*Blacksmith and Wheelwright.*

RULES FOR FINDING THE HEATING SURFACE OF VERTICAL TUBULAR BOILERS.—Multiply the circumference of the fire-box in inches by its height above the grate in inches; multiply the combined circumference of all the tubes in inches by their length in inches, and to the sum of these two products add the area of the lower tube or crown sheet. Divide by 144, and from the quotient subtract the combined area of all the tubes, and the fire door. The remainder will be the number of square feet of heating surface.

PHONEIDOSCOPE.—M. Guebhard describes a method of projecting the coloured rings which are produced on the surface of mercury by the breath or by a drop of volatile liquid. He also obtains membraneous rings by substituting a drop of cullodion or of varnish for the volatile liquid. These rings may be fixed upon a card and preserved indefinitely. Phoneidoscope figures may be obtained by pronouncing different sounds so that the breath may be intercepted by the mercurial surface.—*Soc. Franc. de Phys.*

THE COMING COMET.—Star-gazers are anxiously scanning the northern skies in anticipation of the coming comet, which has already been seen in the southern hemisphere, and which may make its appearance in the north at any moment. This comet is supposed to be the reappearance of the famous comet of 1843, which blazed out at that time with a most intense brilliancy.