ENGINES AND LIGHTNING RODS.

Our extracts from Knight's "Mechanical Dictionary,"* for this week, include some illustrations and descriptions of interesting forms of engines, and of a large number of lightning rods. Fig. 1 is a

COMPRESSED AIR ENGINE

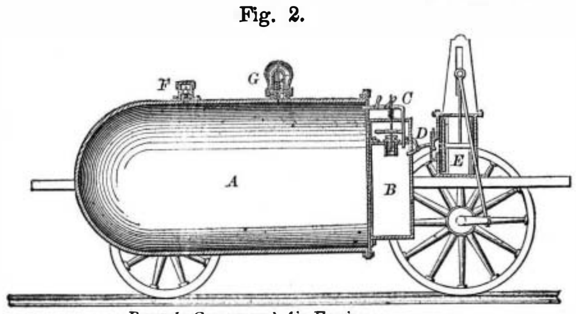
used in the lower shaft of a mine in Scotland. The steam cylinder, C, is 15 inches in diameter and has 3 feet stroke. It drives two condensing air pumps, P P, which work alternately, one on each side of the beam center, delivering the air into the center reservoir, N N, from which it passes into the main pipe, M. The beam is connected at the other end to a crank and fly wheel, F, for the purpose of equalizing the motion. The air pumps are inverted and are worked with crossheads sliding in vertical guides, by means of side rods, from the beam. They are fitted with ball valves, of which there are three sets to each pump, each set consisting of 44 balls, two inches in diameter. The balls are confined by separate cages to a lift of half an inch. A stratum of water, supplied by a pump, W, covers the piston valves and the delivery and inlet valves, through which all the air has to pass. The water flows from the central reservoir through the small pipes, O O, into each of the air pumps during the period of their downward stroke. Locomotives of the type shown in Fig. 2 are also driven by compressed air. In the reservoir, A, the air is compressed and is admitted to the chamber, B, where it is expanded to working pressure. The emission is regulated automatically by a plunger in a tube passing through the roof of the chamber, B. Above the plunger is a spring which yields to the normal pressure of the air in the chamber; but when, owing to the withdrawal of air to the working cylinder, the pressure in the chamber is relaxed, the spring depresses the plunger, and the connections of the latter turn a faucet valve in the pipe, C, and allow the passage of air from the reservoir, A, to the chamber, B, to restore the working pressure in the latter. The compressed air passes by the pipe, D, to the cylinder, E, where it acts in the manner usual with the double-acting steam engine, and exhausts into the atmosphere. F is the supply aperture through which the reservoir is charged, and G the safety valve. The piston rod, crosshead, and pitman connect in the usual way with the crank and driving shaft.

A curious form of rotary steam engine known as the

DISK ENGINE

was invented by Captain Ericsson, and improved by Bishopp and others. In the Ericsson engine, the disk revolves, and

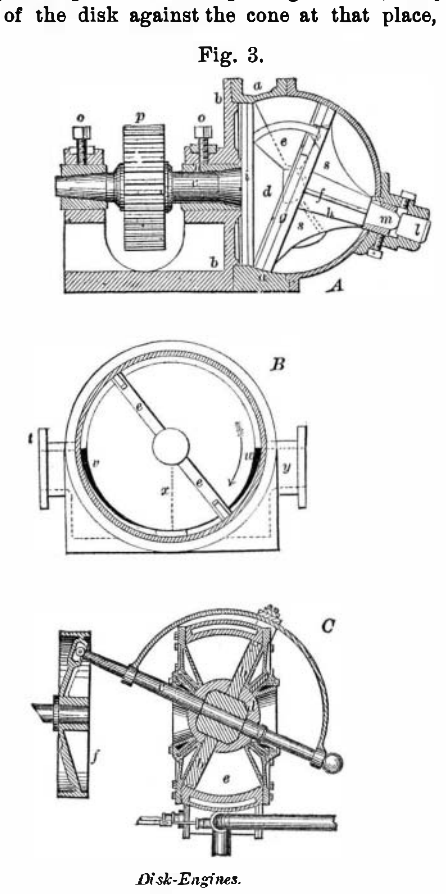
Fig. 2.



Parsey's Compressed-Air Engine.

in the Bishopp engine the disk oscillates. Ericsson's machine is shown at A B, in Fig. 3. Steam is admitted into a spherical chamber, *a*, by the neck, *t*, and opening, *v*, and being there prevented from passing the line, *x*, by the pressure of the disk against the cone at that place, it presses

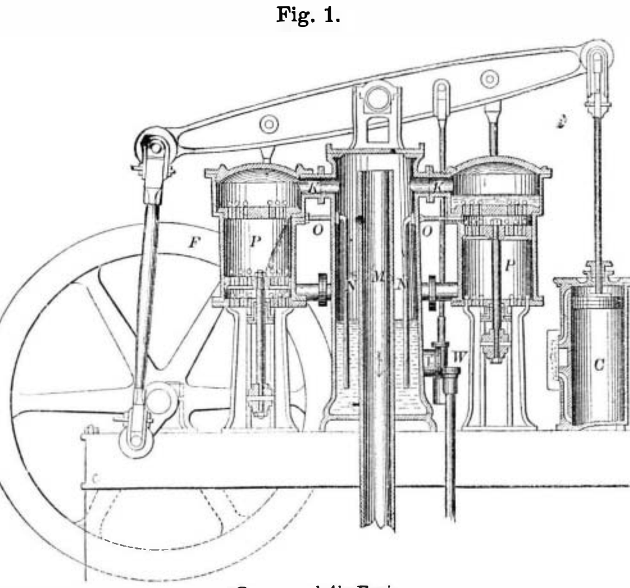
Fig. 3.



Disk-Engines.

against the upper leaf, *e*, which, together with the cone and disk, is thereby carried round in the direction of the arrow. When the leaf has passed the upper part of the opening, *w*, the steam that has been acting upon it escapes; but at the same time, the opposite leaf has passed the top of the steam opening, *v*, and is carried round in a similar manner. The engine has no valves, the action of the piston is at all times direct, and the machine can be stopped, started, or reversed at any position of the piston. In Bishopp's engine, shown at A, the disk and shaft do not reverse on their axis, though the ends of the shaft describe circles as the disk "wobbles" on the lines, keeping one radius on each side in constant contact with them respectively. An abutment is formed by a

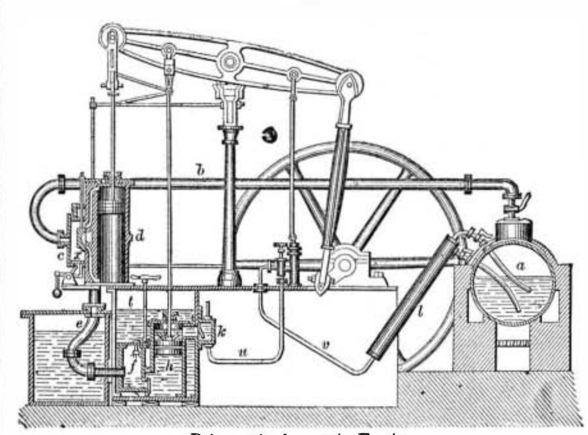
Fig. 1.



Compressed-Air Engine.

plate, *e*, which divides the annular space in which the steam works, the lower portion of the disk having a radial slit which enables it to slip back and forth on the abutment plate, *e*. The steam is admitted on one side of the abutment, and exhausted on the other, the live steam pushing the disk before it, by crowding between the disk and the conical head, and causing the outer end of the arm to communicate

Fig. 4.



Delaporte's Ammonia-Engine.

rotary motion to a wheel, *f*, to which it is connected by a universal joint.

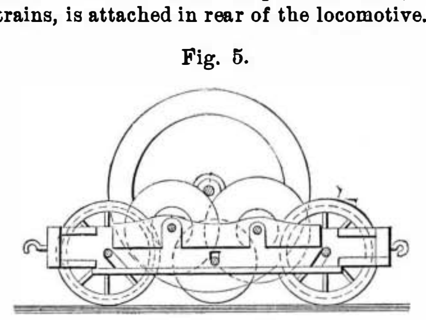
DELAPORTE'S AMMONIACAL GAS ENGINE,

shown in Fig. 4, is operated by ammonia vapor; *a* is the boiler; *d*, the cylinder; and *b*, the tube communicating between the cylinder and boiler; *c* is the valve box, and *x* the slider, by means of which the gas is introduced alternately above and below the piston; *e* is the eduction pipe, and *f*, the condenser and dissolver. The injection water is introduced by a pipe, at the top of the condenser, *f*. The solution passes from *f* to *h*, from which it is withdrawn by the piston, and passes through the reservoir, *k*, and the tubes, *u* and *v*, by which it is returned to the boiler, a small forcing pump aiding in this operation. The water, which has been deprived by heat of its ammonia, is withdrawn from the bottom of the boiler by the lower tube, and passes into the jacket, *l*, where it imparts a portion of its heat to a solution in the tube, *v*, which is on its way to the boiler.

THE MAHOVO

is the name given by its inventor, Captain Von Schubersky, of Russia, to an adaptation of a fly wheel to accumulate a reserve of force to be used at intervals when a greater power is needed. The device is shown in Fig. 5. A pair of heavy fly wheels are mounted on an independent truck, which, in railway trains, is attached in rear of the locomotive. In the

Fig. 5.



Von Schubersky's Mahovo.

intervals between the three pairs of running wheels are placed two pairs of friction wheels, resting immediately on them. In the angle between these rests the large axle of the mohovos, huge fly wheels which overhang the track. When the train moves, the running wheels impart motion to the friction wheels, and the latter transfer this movement to the fly wheels. As the train moves from rest, the velocity of the fly wheels is gradually accelerated until it attains a maximum corresponding to the maximum velocity of the train. If steam now be shut off, the fly wheels become a source of power, and will return a portion of the work stored up in them, so that they may be used to assist the engine in ascending grades.

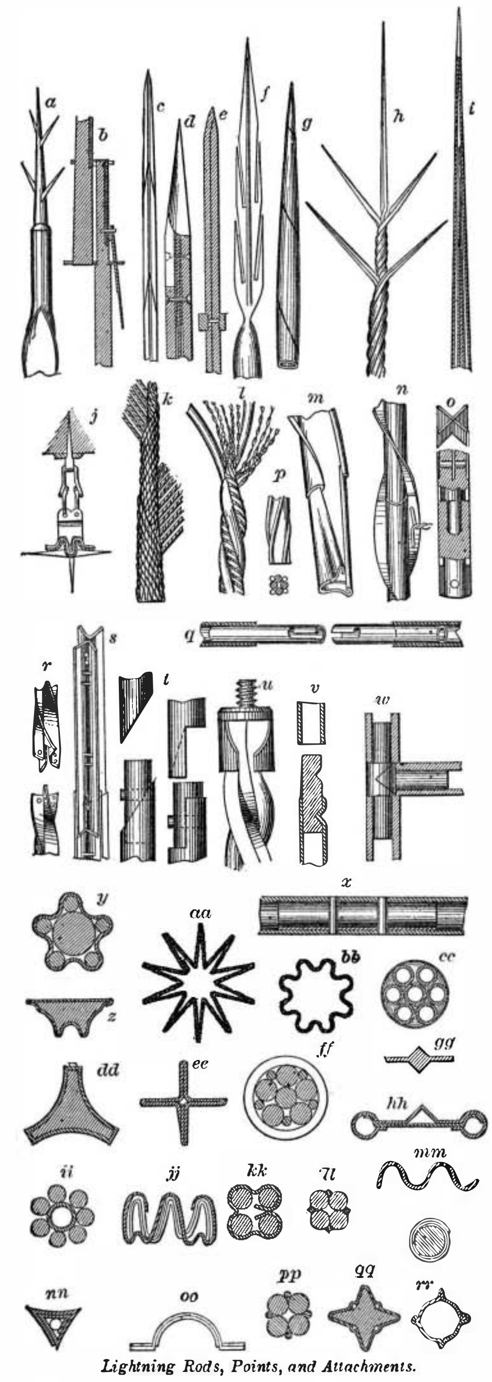
We add, in Fig. 6, a large number of shapes of

LIGHTNING RODS,

which may be described as follows:

a has a series of points formed of spiral coils, combined with a tubular portion, forming the tip. The conductor is a flat strip. *b* is a jointed tubular conductor for vessels. It is divided at the head of the lower mast, a branch leading down the shrouds on either side to the water. *c* is an iron rod tipped with copper, the point of which is gilded. *d* has a central copper slip inclosed between iron side pieces; the points of connection have interposed zinc plates. At *e* the iron rod is grooved to receive a copper slip. The joints are secured by screw-threaded washers. At *f* the point is formed with two opposite wings. The rod, *g*, is composed of a single strip of copper wound spirally so as to form a tube. *h* is composed of several strands of wire laid together so as to form a rope, and having several tips. The point, *i*, is formed of three or more metals inclosed one within the other, the most fusible outside. *j* is an insulating attachment with additional conductor points at the coupling of rod sections. *k* is a copper cable, composed of a central wire rope and two exterior strands laid up in opposite directions. *l* comprises two or more copper wire ropes intertwined with an equal number of iron rods. *m* is a series of metallic strips, forming a tube, are joined together. *n* is a metallic strip, doubled up or corrugated so as to form a tube with spiral flanges. At *o* the joints of the rod are coupled by pieces cross shaped in section and secured by rivets and bolts. *p* has four twisted rods with wire warming. At *q* the tubular sections are united by short pieces, slotted inside so as to form a species of bayonet joint, and held by pins. *r* is composed of two strips of sheet metal, riveted together at their angles and twisted spirally. The strips in *s* have slots through which staples fasten them. *t* is connected by short pieces fastened by pins, *u* is an exterior cable stiffened by a spirally flanged core, and the sections of *v* are secured by plugs fastened by indenting the tubes into suitable depressions. At *w* the sections are coupled by an interior cylinder and a tapering plug projecting from each of its ends. At *x* an interior tube with

Fig. 6.



Lightning Rods, Points, and Attachments.

pins holds the ends of the tubular sections together. *y* to *r r* inclusive represent sections of various kinds of patented rods.

* Published in numbers by Messrs. Hurd & Houghton, New York city.