SIEMENS' STEAM MOTOR.

Mr. Friedrich Siemens, of Dresden, has recently designed two motors one of which—the caloric—we have already described. The second is a steam motor equally simple and ingenious. It consists of a casing of sheet iron A, Fig. 1, which is cylindrical at one end and pear-shaped at the other. The whole is maintained in an oblique position by means of an iron support *b b*. The inner portion A is free to revolve round its axis of motion *l l*, while the exterior B is stationary; *d* is a second casing surrounding the lower projection of it, and *c* a condenser. Around the interior of A a helix, also of sheet iron, is wound so as to present to the eye the appearance of a series of interplaced funnels. The inner surface of B is lined with fireclay, as in ordinary furnaces. The condenser consists of a pipe of convenient diameter encircling part of the motor a sufficient number of times. One end communicates with the upper portion of A, and the other with a vessel of water. The space *k* between A and its second casing *d* may be called the boiler of this apparatus; it is filled with water by means of a small opening in the superior part of A. A Bunsen burner placed beneath supplies the heat, which converts the water into steam. When the steam is generated, it passes through circular orifices perforated in the under surface of A, and rises in the interior of the motor. The force with which it impinges upon the sides of the helical sheets is at first insignificant, but it gradually increases with the continued generation, and consequent pressure of steam, so as to overcome the inertia of the motor, and to impart to it a comparatively rapid movement. When the steam is circulating through the upper part of A, it enters the condenser, and is converted into water, which descends and feeds the boiler. The products of combustion escape through a flue inserted in the outward fixed casing, and which communicates with the cylindrical space B. To obtain a motive power of 16 lb. it is necessary to increase the supply of heat, and for this purpose a series of Bunsen burners is employed. The movement is transmitted by means of the shaft *h*, which is connected with the axis of the motor either by bevel wheels or, in case of easy work, by a spring *g*.

When once rotating, this motor requires but very little attention. As both water and steam are confined within the revolving casing, and as there is no communication whatever between the interior and the exterior, there is but little friction, and therefore a considerable gain of power. Instead of a safety valve, the inventor has adopted a small plug of fusible metal, which is inserted in the upper part of A. This safety plug is also used as a hermetical stopper for the water aperture. The only object attained by this twofold office is greater simplicity in the general mechanism.

The chief difficulty in the construction of this motor is to prevent the circulation of the water through the spiral spaces *s*, and approximately to maintain the horizontal level of the water, notwithstanding the movement of rotation. Of course absolute horizontality could not be preserved on account of the centrifugal force caused by the rototary motion, for it may easily be seen from the figures that the water revolves with the cylinder A. This inconvenience has been considerably diminished by making the spirals present extensive conical surfaces. This disposition affords a free downward passage to the water, and permits only the steam to circulate through the helices.

When the motor is constructed for maximum power, the condenser is suppressed, and a funnel-shaped vessel, providing the water supply, is fitted into the upper part of A.

Mr. Siemens thinks that other fluids than water may be advantageously used in his motor. He specially recommends oil and mercury. The latter would give more power than water on account of its greater density and lesser specific and latent heats.

The principal advantages of this invention are the direct action of the steam, a simple mode of condensation, utilisation of the full expansive force of the steam, and a gain of power corresponding to a great diminution of friction.

Like the caloric, this motor is only the realisation of a scientific idea. It is a germ which time perhaps may develop and cause to fructify.

Russia now has more than ten thousand miles of railroad, which has grown from only eight hundred and twenty-nine miles in 1857.

PRINCIPLES OF SHOP MANIPULATION FOR ENGINEERING APPRENTICES.*

By John Richards, M.E.

(*Continued from page* 74, vol 3.)

WIND POWER.

Wind power, aside from the objection of uncertainty and irregularity, is the cheapest source of power. Steam machinery, besides costing a large sum as an investment, is continually deteriorating in value, consumes fuel and requires skilled attention. Water power also requires a large investment, greater in many cases than steam power, and in most places the plant is in danger of destruction by freshets; but wind power is cheap in every sense, except that it is unreliable for constancy except in special localities, and these, as it happens, are for the most part distant from other elements of manufacturing industry.

The operation of wind wheels is so simple and so generally understood, that no reference to mechanism need be made here.

The force of the wind, moving in right lines, is easily applied to producing rotary motion, the difference from water power being mainly in the weakness of the wind currents and the greater area of the surfaces required to act upon. Turbine wind wheels have been constructed very much the same as turbine water wheels.

In speaking of wind power, the propositions about heat must not be forgotten, in fact the apprentice should so school his mind and habits of thinking that, whenever the subject of power is to be considered in any way, he will at once trace out the connexion with heat.

We have seen how heat is almost directly utilised by the steam engine, and how the effects of heat are utilised by water wheels, and the same connexion will be found with wind wheels or wind power, because currents of air are due to changes of temperature, and the connexion between the heat that produces such air currents and their application as power is no more intricate than in the case of water power.

MACHINERY FOR TRANSMITTING AND DISTRIBUTING POWER.

To construe the term, transmission of power, in a critical sense, it should, when applied to machinery, include nearly all that has motion; for, with the exception of the last movement, or where the power passes off and is expended upon the work to be performed, all machinery, of whatever kind, can be regarded as machinery of transmission. Custom has, however, confined the use of the term to such devices as are employed to convey power from one place to another, without including the organised machinery through which power is applied immediately to the performance of work.

Power is transmitted by means of shafts, belts, friction wheels, gearing, and in some cases by water or air, as the conditions of the work may require. Sometimes such machinery is employed as the conditions do not require, because there is, perhaps, nothing of equal importance connected with mechanical engineering about which there exists so great a diversity of opinion, or in which there is a greater diversity of practice than in devices for transmitting motion.

I do not refer to questions of mechanical construction, although the remark is equally true if applied in this sense, but to the kind of devices that are best in special cases.

Shafts for transmitting power.

There is no use in entering upon explanations of what the learner has before his eyes. He sees shafts wherever there is machinery; he may also see the extent to which they are employed to transmit power, and the usual manner of arranging them; he can read in various text books of the exact data for determining the amount of torsional strain that shafts of a given diameter will bear; that their capacity to resist torsional strain is as the cube of the diameter, and that the deflection from transverse strains is so many degrees, with many other matters that are highly useful and proper to know. I will, therefore, not devote any space to these points here, but treat of some of the more obscure conditions that pertain to shafts.

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