MOTIVE POWER FOR SMALL MACHINES.—(See page 33.)

The want of a cheap motive power capable of driving sewing and other machines has long been felt, and much ingenuity has been expended in attempting to supply it. The contrivances which have been designed to attain this end may be divided into two classes, the first being composed of motive powers properly so called, and the second consisting of accumulators of power, or contrivances by which a considerable amount of manual force exerted for a short interval is stored up and given out as required in the form of a lesser force exerted for a longer period. Amongst the motive powers of the first class we have had small turbines driven by water supplied from the ordinary mains, "domestic" steam engines, small gas engines, and electro-magnetic engines, some few of these contrivances being well designed, but none of them, so far as we are aware having come into general use.

Machines of the second class have consisted, with but few exceptions, of arrangements of springs brought into a state of compression or tension by gear worked by hand, their recoil being utilized to actuate the machine to be driven. The arrangement which we now illustrate on page 33 and which has been designed by Mr. Joseph Holmes, London, England, belongs to the second class, but it differs from its predecessors in an important respect, namely, that instead of the power being stored up by the tension or compression of steel springs or by raising dead weights, the necessary force is obtained by the pressure of the atmosphere upon the surface of a piston moving in a cylinder, and below which a vacuum has been formed. The advantages of this arrangement are that a practically constant force is obtained acting through any required distance, while, at the same time, the whole machine can be kept comparatively light. Thus, for instance, if we suppose a vacuum of 14 lbs. per square inch (and the arrangement admits of an almost perfect vacuum being obtained) to exist below a piston 9 in. in diameter, the pressure on that piston will amount to 890 lbs., or be nearly equal to a dead weight of 8 cwt, while the weight of the parts required to obtain this result is very moderate. On the other hand, too, the force exerted on the piston, being practically constant throughout its stroke, there is no necessity to resort to fusees or other contrivances to equalise the force exerted, as is the case when steel springs with their variable resistance are employed.

The arrangement adopted by Mr. Holmes will be readily understood by reference to the engravings, fig. 1 being a front, and fig. 2, an end elevation of the motor.

In these figures, A, is a cylinder of suitable diameter and length fitted with a piston, B, which moves freely—but perfectly air-tight—in it. To this piston is attached a band or chain C, which extends through one end of the cylinder over a pulley D, to the drum E; the latter being geared to a shaft F, which can be turned by the wrench or key P, so as to wind up or raise the piston from the bottom to the top of the cylinder. Instead of the chain or band C, a rack may be employed. The shaft F, is connected by a clutch G, or a ratchet and pawl or other suitable contrivance, with toothed or frictional gearing, or with belts and pulleys whereby the motion imparted to the shaft on which the drum E, is fixed, is communicated to other shafts. The gearing or pulleys are so proportioned that any speed communicated to the first wheel or shaft is greatly accelerated in its transmission from it to the last shaft H, of the series, which is connected directly or indirectly with the sewing or other machine to be driven. H^1, is a fly or band wheel, which may have grooves at different diameters to correspond with the pulley attached to the machine to be driven, and by which the speed or power may be regulated to suit the work to be performed.

The piston B, as before stated is fitted to work air-tight in the cylinder A, and the latter is closed air-tight at the bottom or at one end, the top or other end being open. When the piston is raised or drawn towards the top or open end of the cylinder a vacuum will be produced in the cylinder below the piston, and the latter will be pressed down with the full pressure of the atmosphere, and this force is communicated as explained through the aforesaid gearing to the machine to be driven. It will be seen from the engraving that the motor is provided with a simple brake applied to the wheel H_1, this brake being so arranged that it is always in action except when removed by the pressure of the foot on the treadle shown. By simply pressing or releasing this treadle the motor is started or stopped at pleasure, and thus perfect command is obtained over the motion of the machine which is being driven.

Of course, in such an arrangement as that we have described a vital point is to obtain a piston which shall move freely in the cylinder, and which shall yet maintain itself air-tight without skilled attention. Practical experience has proved that such a piston can be constructed.

With a motor of the kind we have described, having a 9 inch cylinder and 2 ft. stroke of piston, a force of about 1800 foot-pounds can be stored up, the piston being raised by 82 turns of the crank handle, and the work of winding up being easily accomplished in one minute. This amount of stored-up work is sufficient to make about 5000 stitches with a sewing machine, or to sew about seven or eight yards, according to the quality of the work. The arrangement in modified forms is also available for a variety of purposes where the exertion of a small power for long periods is required, and we anticipate that numerous applications will be found for it.—*Engineering*.

PEAT-CONDENSING MACHINERY.—(See page 36.)

The total absence of coal in the strata of this and the adjoining province is a source of weakness which has for a long time been patent to the most careless considerer of our progress in manufactures. Our water power is abundant, but we have no coal and our vast forests already begin to fail to supply fuel necessary even for household consumption. We have however vast deposits of a most useful fuel hitherto almost untouched, in the peat-beds of Anticosti and other places. Deposits of this fuel exist to a great extent in Great Britain and Ireland and the present high price of coal there has turned the attention of the public to this hitherto neglected source of heat. Experimental trials of peat-condensing machinery have recently been made there in the presense of influential capitalists and engineers, all of whom expressed their opinion that the success of the project was undeniable. It is quite unnecessary to remind our readers that the question of fuel here, in Quebec and Ontario, is in a very unsatisfactory state. Our forests are beginning to fail, and our deposits of metallic ores are for the most part necessarily neglected. This being the case we may learn a profitable lesson from the misfortune of the present scarcity of coal in England.

We give on page 36 a plan and side elevation of a peat-condensing machine by Messrs. Clayton, Son, and Howlett, recently introduced to public notice. The illustration is from the *Engineer* which remarks upon it as follows: "It is unnecessary for us here to enlarge on the importance which, as our readers know, we have always attached to the utilisation in some form or other of the immense deposits of fuel contained in the peat fields of Great Britain and Ireland, and we will therefore at once proceed to a description of the details of this machinery, which, to our minds, is certainly the nearest approach to a solution of the great question of how peat can be freed from the hygroscopic and fixed water it contains in its natural state, and also reduced in bulk as to be convenient for transport storage, yet brought forward.

In the system which Messrs. Clayton, Son and Howlett propose to pursue, however, the peat, when cut, is first of all filled into what they called "squeezing trucks," in which, during its journey to the works, by the action of a screw or lever, a large proportion of free water is forced out through perforations in the bottom and sides of the said trucks It will be seen from our illustration that, separate from the moveable driving engine, the condensing machine itself consists primarily of hoisting gear, which is connected or disengaged from the motive power by a hand lever, and is used to raise the peat as it arrives from the bogs to the level of the vertical hopper, but which is clearly an arrangement quite extraneous to the vital principle of the manufacture. The mastication or trituration of the peat, after it has been filled into the hopper, is effected by a vertical shaft revolving in the upright chamber, and carrying a series of cutting blades set round the shaft like the thread of a screw, and by the action of which the peat is forced down into the long horizontally-placed cylinder. This also is fitted with a revolving shaft, passing through its centre, on which is a forcing screw and also a set of discs arranged to form a dissecting double screw, and at the end of this cylinder further from the hopper are fitted cutting blades of hard steel. The action of the machine is then this: the peat, forced into the horizontal cylinder by the joint action of the blades and screws, is carried