plication would tell in favor of electric transmission, because the loss is nearly proportional to the load in the electric, while in the mechanical transmission it is approximately constant and independent of the load. On the other hand, the capital loss of electrical transmission in factories of this class is usually greater than that of mechanical transmission. The problem of calculating for any special case is a comparatively simple one, because where the power is centralized it is not difficult to arrive at any required data for calculation. The power required is easily ascertained, and the loss in transmission is easily estimated. The best proof of the value of electric transmission in factories of this class is the fact that growing experience of its use is leading to its enormous extension, notwithstanding its greater first cost. The electrical engineer's best argument is appeal to experience of convenience, which cannot be directly valued in figures.

Group II. differs in many essential respects from Group I.

In nearly all such cases electric transmission compares favorably in first cost, and still more favorably in working cost, with any other system of transmission. Its only serious competitor in some cases is hydraulic transmission, and this generally is more of a useful coadjutor than a rival In this group, however, the whole question of comparison bristles with difficulty. In the first place, it is extremely difficult to arrive at any approximation to accuracy in determining the amount of power actually required to perform the various operations usually performed by steam engines As a general rule such factories as those instanced in Group II. use steam engines worked with low-pressure steam. These engines are rarely kept in perfect repair, and the indicator diagram gives little information as to the effective power. It is not usual to make provision for indicating such engines, and there are many gate-ways for the escape of heat. The best way to arrive at the actual power is to apply an electric motor to the work, and record the measurement of power thus obtained. While in many cases such results accord very closely with skilled guesses at the actual power, there are many surprising differences. Another very important element is the fact that in many such factories—for example, in paper mills, calico printfields, chemical works and dye houses—there is a large quantity of steam required for heating purposes, and this has a most important bearing on any proposal to substitute electric motors for the small steam engines. Not only does such substitution involve the use of a steam distribution independent of the power distribution, but it complicates the calculation of efficiency; because, in the case of a paper machine, for example, if the whole of the exhaust steam from the driving engine be used for heating the rolls, then the efficiency of the engine ceases to be of any importance whatever. The engine will exhibit its inefficiency by rejecting heat which is afterwards profitably utilized elsewhere. Hence arises the custom so puzzling to one who wishes to compare the power efficiency of factories of different kinds, of checking the efficiency by equating the coal consumption to the output of the manufactured product. This after all is the real test as between one factory and another, but it altogether conceals the factors in the calculation which enable one to localize the losses. Even in the case where this complication of heating does not exist, there is usually in such factories so constant a variation of load that it is almost impossible to arrive at accurate data of the actual power used. Notwithstanding these difficulties, the case is so good for electric transmission of power, under such conditions, that it is not difficult to prove its superior economy in nearly every case falling under the description of Group II.

Even in cases where the whole of the exhaust steam is profitably used, and the efficiency of the engines themselves is of no importance, there is a serious loss of heat between the boiler and the engine. Every gallon of water sent to waste through the steam traps and drain cocks represents a pound of coal uselessly burnt. Even when the pipes are well covered and perfectly steam-tight this loss is considerable. Last year, in response to questions addressed to users of power in England, Scotland, and Ireland, the answers which have been compiled in tables, were obtained by the courtesy of about twenty out of one hundred factory owners. While, of course, it is impossible that these results as a whole can be quantitatively correct for scientific purposes, they possess a great value as a qualitative analysis of this important element of manufacturing cost. These tables show very clearly that in all cases where there are many small engines the cost of power is a maximum. There is a decided tendency to exaggerate the power of small engines, and if this be taken into consideration in addition to their well-known inefficiency, the result comes out much more seriously against them than is indicated by the figures in the tables.

(To be continued.)

CLOTHS REQUIRING UNEVEN LIFTS IN SHEDDING.

The production of some kinds of cloth ornamentation depends on the working of a number of threads which interweave in the same order when forming the body of the cloth. It will be evident that any figure on an extensive scale, which requires a number of figuring shafts, would of necessity create an unequal shedding plan, some lifts being very light while others are very heavy. The uneven lifting is noticeable in some patterns requiring a large number of shafts of healds. If the size of the spot was increased, or the spots placed farther asunder, the unevenness of lift would be increased. The fact that in double-lift dobby machines the descending healds or shed aid in pulling up the ascending healds is generally acknowledged, and where the number of healds raised for each shed are nearly equal, the working of the loom is regular. In accordance with the pegging plan given, the seven healds with