

DIMINISHING RETURNS IN MANUFACTURES<sup>1</sup>By CHARLES W. MIXTER<sup>2</sup>

THE classic writers, as is well known, excluded diminishing returns from direct operation in manufactures. The "limiting principle" in the extractive industries was the universal pace-setter for all economic society, and had its effect in manufactures only indirectly *via* increased cost of food and other raw materials. Even at the present day it is perhaps not generally appreciated that the law or principle of resistance which meets all expansion or extension of wealth-creating endeavor is universal. Unless the resistance is fully counteracted by invention or the improvement of the arts, we have diminishing returns along whatever line the increase of the scale of operations takes place.

One advantageous angle of approach to the problem of the "limiting principle" in manufactures is to ask the reason for the survival in the general competitive system of things of many small-scale industries, notably those engaged in producing high-grade, hand-made articles. The immediate answer (apart from considerations of the extent of the market) is that when such industries attempt large-scale operations their costs become too great relatively to the output. In a characteristically mechanical industry, on the other hand, the output is increased by the powers embodied in the machines sufficiently to overcome the increased costs, and hence with them a large scale of operations may be successful and permanent. The one class of businesses is in the way of realizing considerable improvements in the arts as they expand, because they have a great mass of machinery with which to make them. A business of the other class has conditions which do not lend themselves to increased powers of production, and hence the obstacle of increasing costs confines them to a small scale of undertaking.

The specific subject before us has been recently handled with a wealth of fresh illustration by Professor Dewing, in an article on "The Law of Balanced Return."<sup>3</sup> His analysis of the situation though

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<sup>3</sup>*American Economic Review*, Vol. VII (Dec., 1917), p. 755.

searching, is not, however, complete. Besides "labor costs" and "capital costs" with respect to both the merchandising side and the plant side of a manufacturing-business, there are also what may be called managerial costs. There is both plant proper "overhead" and management "overhead." When the small business of any sort, predominantly mechanical or predominantly hand work, multiplies its force of workmen and multiplies its equipment, stock of material, etc., managerial overhead mounts upward. This last is in the main what that "resistance" consists in which must be overcome by increasing productivities, if there is to be escape from diminishing returns or a shrinking to avoid bankruptcy to small-scale production again. I do not think that the proportion of labor cost to capital cost in the product has the significance that Professor Dewing attached to it. It does not work as positively as he assumes. The fact is, any business whatsoever will fail if it grows rapidly, and in so doing merely has recourse to "quantitative accretions" of labor and plant. The expanding overhead in that event will swamp it.

One of the most striking illustrations of his thesis in Professor Dewing's article is the one given (pp. 760-761), apparently from personal experience, of the case of the shoe manufacturer of long training and great success as a small-scale producer who failed utterly when he built a new and larger factory, but still made without change a "particular grade of shoe," presumably of the finer sort. He had the advantage of a much better equipped factory, we are told, a "show establishment" in place of one "rather antiquated and inefficient." He could not compete, however, with "smaller and technically less efficient factories," because they had compensating advantages in being smaller and set a price he could not meet. His own "fixed capital costs" per unit of product varied adversely after he enlarged; they became "so much greater proportionately to the cost of labor" as to be his undoing. The cost of labor did not vary, being governed before and after by the fixed piece-rate "scale" of his locality. Also during the experiment (for that is what is really before us), by implication, there was no trouble from an insufficient market for

the product. The bankruptcy came not from bad debts or other increased selling costs, not from increased wages per man employed, but simply from the fact that under the great scale of operation "the fixed capital cost was too great for that particular line of product." Of course this may have been precisely so because our "highly successful" man, "spurred on by his success," like many another, lost his head and overdid his "show establishment" to a degree that made it technically less, not more, efficient than his old one. But we are not told that such was the case, and therefore we may rule it out. Rather there is one last fact that Professor Dewing does tell us (not last, of course, in the order of his presentation of the story) which may be taken as the key to the whole situation, and that is: "He exercised, the same entrepreneur ability in both factories." That, I submit, was probably the difficulty. Not that he continued to make the same grade of shoes, but that he exercised "the same" entrepreneur ability. In his expanded business he had to exercise a new and different and improved entrepreneur ability. The resistance came; he had to meet it or go under. He wasn't necessarily doomed to bankruptcy because of the grade of his product or the scale of his operations.

The present writer now has himself a very definite thesis to maintain. Just what happened in the larger shop that brought failure? Exactly in what did the "resistance" consist in this instance? We may answer concretely as to the strong probabilities drawing from the experience of many similar instances.

One of the first prevailing phenomena when a small shop grows into a large one is trouble with regard to inspection. "Inspection" does not mean merely the careful scrutiny of the finished product before shipment to maintain its "quality"; it means, rather, in any business where there is assembly of parts, the proper testing by standards—written standards—of the accuracy of all the operations that are performed on each of the parts preparatory to assembly, intermediate group assembly as well as final assembly. Moreover, at every stage of production, inspection means verifying the count as to quantity; otherwise the parts do not "match up" (shortages and excessive "overs"), though each be made perfectly. In these matters the practice of most small shops is exceedingly rudimentary. The ordinary workmen themselves are relied upon to be the primary inspectors all along the line, and the proprietor or his overworked foreman is the only over-inspector. There are, as a rule, no written standards—bills of material, drawings, or

other specifications; these things the various persons responsible for production carry in their heads. Even if the specifications are written out to a degree they are not systematically written, recorded, and made universally available. Having this and that written on some paper hung on a nail somewhere, some leading workmen or foremen alone knowing where it is, is but once removed from having it in peoples' heads only. A very common practice is to go by "samples" instead of blueprints, and to refer to things in the manufacturing orders by name only rather than by definition of size, and to omit description of quality and quantity of material. It is always rough work, with numerous "fall downs" in several ways, that is done with respect to specifications by using "samples."

These crude devices answer as long as the business is small so that the eye of the proprietor oversees everything, and so long as he has "experienced" workmen and foremen who know all the little ins and outs of the processes; but as soon as expansion comes on this basis, comes trouble—serious trouble. Strangers are taken into the workrooms and they have difficulty in finding out what is expected of them. Even after they do find out they naturally give themselves the favor of the doubt as regards the execution. It is fundamentally wrong in principle for those who make things and are primarily responsible for volume of output, themselves to pass upon the doubtful points as to how well they have made them. Consequently, as soon as the little old-style, unified shop expands into a large, complex shop there is a shifting of responsibility all along the line and back again as regards matters involving the function of inspection. The proprietor tries to mend matters by promulgating rules and putting pressure upon individuals. He is slow to change the method of inspection; and if he does change it, that means hiring inspectors as such and an elaboration of his clerical procedure, which costs money. The proprietor is confronted obviously by a dilemma. One way he meets with increased costs through delays in production and postponed deliveries and also through increase of work that has to be done over and increase of wholly spoiled material; the other way he meets with increased costs to keep these things down. Professor Dewing seems to assume that the increased cost will come in the first form—that the proprietor will not be able to surmount the difficulties of "final inspection" even, and the increase of "seconds" shipped will ruin the goodwill and so the business.