system at the station consists of three No 5 Daft dynamos, actuated by a Wright automatic cut-off steam engine, having a cylinder 18 x 42 inches and a flywheel 16 feet by 26 inches. There is, in addition, a small arc-light Daft dynamo used for lighting the station and boiler room. The machines are connected with a switchboard, so that they can be placed in "parallel" or "series," as may be desired, and there is in addition an automatic cut-off, which operates in the event of a short circuit on the track, so as to open the circuit at a fixed point, and at the same time give the engineer notice by ringing an alarm. There is also an attachment to indicate when the short circuit is removed. The machines are connected to the track by means of 0000 copper wire, with Underwriter's line insulation suspended upon poles.

The motor has already run seyeral hundred miles on the short track at 14th Street, making many hundred stops and starts, involving much severe work, hauling four cars for a considerable portion of the time, and also a two car train, for the purpose of making close observations as to the difference in consumption of fuel. With regard to this all-important question, the tests are as yet necessarily incomplete ; but so far as they have gone, the indications are claimed to be satisfactory. The extraordinary adhesive properties of a locomotive operated in this manner are evident. This feature is well illustrated on the line in Baltimore, which at one point has a curve of 75 feet radius on a gradient of 353 feet, and yet no difficulty has been experienced by the motor in ascending this grade with a loaded train. So successful has been the working of the Baltimore road that two more motors have been ordered, making a total of four. — *Scientific American.*

INDIRECT ADVANTAGES OF INVENTION.

Every year there are numerous mechanical devices brought out that are to "fill long-felt wants," and "revolutionize" matters in their particular line ; apparently the wants are just as many as ever, and revolution progresses slowly. An inventor almost always makes more wants than he fills ; the value of his invention is generally more in this fact than in the real worth of what he invents—in this fact and in the fact that it stimulates others to exertions. A few years ago the automatic cut-off steam engine was to take the place of all others ; there are a great many throttling engines built in these days, and apparently always will be. That this is true does not argue any fault with automatic engines. Since the advent of automatic cut-off engines, great improvements have been made in throttling engines that have enabled them, for some purposes, to hold their own. But these improvements are largely due to the invention of automatic engines. The automatic engine cuts off short, and it was discovered that a plain slide could be made to cut off at half stroke, or shorter. The automatic engine governor closely, and this fact had a good deal to do with the invention of better throttling governors.

So it will be found in a hundred other things. If Smith or Jones makes an improvement in steam engines or printing presses, the world is chiefly advantaged in the improvements, and every one else who builds steam engines or printing presses is moved to make to avoid falling behind in his business. The fact that some are progressive prevents the possibility of conservatism, in a bad sense, in the others ; comparatively a few progressive men in any line of manufacture will keep all the rest alive to the necessity of progress. And this operates advantageously in two ways : Besides inducing progress in others, it prevents the possibility of anything like monopoly that will keep prices at an exorbitant figure. An instance of this is seen in electric lighting. Although a new field to almost every one a few years ago, there have already been so many inventions relating to it, made by different individuals, that competition is sharp enough to keep prices to consumers low ; and there is apparently but little danger of a combination that shall change this. A combination to this end would be sure, in its stimulating effect, to result in further invention that would defeat it. This invention in relation to electrict lighting, in which hundreds have been and are engaged, was largely induced by the efforts and invention of one or two men, the indirect advantages of which outweigh many times over the direct.

Another instance of the influence of the invention beyond what is originally intended, is seen in the steel industry. As soon as a beginning is made with Bessemer steel castings, and the "want" indicated, attention was turned to the subject, and at the present time steel castings of all qualities, and at comparatively cheap prices, are common enough to suit everyone, with the prospect that further efforts will better the product and reduce the cost. But the effect of the use of steel castings has already gone farther than this ; it has had a good deal to do with improving methods for forging by which the product has been improved and the cost reduced ; it has also had the effect to wake iron molders up to the exercise of more judgment and study, that is, to make better iron castings than ever before, and to make them at less cost.

Instances like those mentioned might be multiplied indefinitely. Competition of this kind can be, except in some cases, depended upon to reduce and keep down prices and to further improve the quality of the product ; as invention must be of starting novelty to insure the inventor being allowed to quietly gather abnormal profits for any great length of time. Something new, or the adaptation of old means, is reasonablеy sure to interfere with any plans in that direction. Many times inventors have a false sense of security in their ability to control prices, but an unpleasant awakening is reasonably certain to follow. Their rewards are likely to be fair, but not disproportionately great.—*American Machinist.*

THE EFFECT OF FIRE ON IRON COLUMNS.

Some interresting and instructive experiments have been latèly undertaken by Professor Bauschinger, of Munich, in reference to the safety of cast-iron columns when exposed to the action of great heat. The professor having arranged some cast and wrought iron columns heavily weighted, exactly as they would be if supporting a building, had them gradually heated first to three hundred degrees, next six hundred degrees, and finally to red heat ; then suddenly cooled them by a jet of water, just as might happen when water is applied to extinguish a fire. The experiments showed that the cast-iron columns, although they were bent by the red heat, and exhibited transverse cracks when the cold water was applied, yet supported the weight resting on them ; whilst the wrought-iron columns were bent before arriving at the state of red heat, and were afterwards so much distorted by the water by re-straigthening them was out of the question. In fact if supporting a real building they would have utterly collapsed under the weight they had to sustain. The Professor therefore concludes, as the results of his experiments that cast-iron columns, notwithstanding cracks, and bends, would continue to support the weight imposed upon them, whilst wrought-iron columns, would not. In experimenting on pillars of stone, brick, and cement concrete, the last was found to be the best, cement concrete pillars withstood the fierce action of fire, for periods varying from one to three hours ; brick pillars, as well as those of clinkers set in cement mortar, displayed great resistance ; whilst natural stone-granite, limestone and sandstone were not fire-proof. It would therefore appear that of the several materials for pillars supporting weights, the best for fire resisting purposes were the cast-iron and cement concrete. But the concrete to be perfectly fire-resisting should be made from sulphate of lime (gypsum), not ordinary building or carbonate of lime, nor Portland cement, as neither of these are fire-resisting substances.—*From the Theatre.*

SCIENTIFIC SYSTEMATIC METHOD IN ORDINARY MECHANICAL OCCUPATIONS.

From advance sheets of the *Journal of the Franklin Institute*, we reproduce the principal part of a lecture delivered by Coleman Sceller before the Franklin Institute, of Philedelphia, November 6 :

I propose, this evening, saying a few words to you on the part that systematic, scientific method plays in the most ordinary mechanical occupations, and to point out the need of orderly method in the advancement of all the arts. I had occasion, the other day, to watch the operation of a mechanical shoemaker, at work in the Novelties Exhibition. Boots and shoes were being sewed on this machine, the stiches made with brass wire ; brass staples were selected, automatically, of the proper length, and were inserted in place. My attention had been criticallly drawn to this machine in acting as judge in the class to which it belonged ; not very far away were books, which, in binding, were sewed with wire staples, and between the two were many devices to enable hand-sewing with wire staples to be done with ease. My mind naturally grouped