Scientific American.

MUNN & COMPANY, Editors and Proprietors

PUBLISHED WEEKLY

At No. 37 Park-row (Park Building), New York.

O. D. MUNN, S. H. WALES, A. E. BEACH.

TERMS—Two Dollars per annum—One Dollar in advance, and the remainder in six months.

Single copies of the paper are on sale at the office of publication, and at all the periodical stores in the United States and Canada.

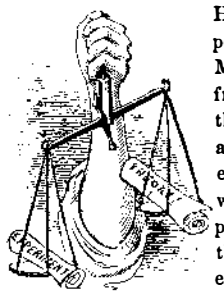
Sampson Low, Son & Co., the American Booksellers, No. 47 Ludgate Hill, London, England, are the British Agents to receive subscriptions for the SCIENTIFIC AMERICAN.

☞ See Prospectus on last page. No Traveling Agents employed.

VOL. III., No. 15....[NEW SERIES.]....*Sixteenth Year.*

NEW YORK, SATURDAY, OCTOBER 6, 1860.

WHAT MAY BE LEARNED FROM THE EXPERIMENTS AT THE METROPOLITAN MILLS.



THE letters in relation to the experiments at the Metropolitan Mills, which pour in upon us from every direction, show that these experiments have attracted a very general interest among the engineers of the country, and while this interest alone would prompt us to examine them, we think they are well worthy of examination from their own intrinsic value. It is almost impossible for any experiments which are conducted with the aid of actual weights and measures, to be wholly barren of results, either in the way of confirming conclusions already obtained or of modifying them. Wherefore, we have great respect for experiments, deeming their conclusions more reliable than those of any process of reasoning, with the single exception of mathematical demonstrations. It requires however the action of reason to determine what is the lesson which any experiment does really teach, and it seems to us that there is one truth which is demonstrated, not, indeed, for the first time, but with new force by the experiments at the Metropolitan Mills.

First, however, let it be remarked, that these experiments show beyond the reach of question, that engines constructed precisely like those that were there used, driving a flouring mill under exactly the same circumstances that there obtained, do not run more economically with cut-offs than they do without. From this single fact, thus absolutely proved, the general conclusion follows that whether the economy of running an engine will be promoted by cut-offs depends upon the construction of the engine and the service that it has to perform.

The great truth, however, of practicel value which is impressed with renewed force by these experiments, is the importance of perfection of arrangement, and accuracy of wormanship, in the construction of the steam engine. The engines used at the Metropolitan Mills were regarded by practical engineers as of a good quality, and yet from the strangling of the steam on its passage from the boiler to the cylinder, or from other defects in the arrangements, the value of expansion was completely overwhelmed. This was the case to a considerable extent in the Smithery engine used by Chief Engineer Isherwood, in his experiments at the Brooklyn Navy Yard, and he points out these defects in the plainest and fullest manner. And here let us state very distinctly that those who are denying the economy of working steam expansively, have no warrant for citing Mr. Isherwood's authority in support of their position. On the contrary, he recognizes this economy fully, and in his learned, able, impartial and truth seeking discussions of his own experiments, he calls attention to the several circumstances which prevented this economy from being more completely realized. We differ from Mr Isherwood in some of his theoretical positions, but we are compelled to admire the manner in which he handles the whole question; and we commend his work to engineers of the country as being full of valuable instruction.

The importance of wise arrangement and nice workmanship in the steam engine is shown not merely by these experiments, but by the whole of its history. The very best engines that have ever been constructed utilize only about one-tenth part of the power of the fuel, while those at the Metropolitan Mills, which are probably of average quality with engines of that size in general use, yield only about one-seventieth part of the power of the fuel. Notwithstanding the immense amount of study and contrivance that has been expended in efforts to bring the steam engine to perfection, it would seem to be still one of the most promising fields for invention that is to be found in any department of mechanism.

THE FINAL DESTINY OF THE EARTH.

Encke's comet, which revolves about the sun in 3½ years, has been observed to complete its revolution in a constantly shortening period, showing that it is being drawn inward towards the sun. This fact has led to the general conclusion by astronomers that the planets are moving in a resisting medium, far more attenuated than our atmosphere, but still sufficient to affect their motions. If this is so, it follows by strict necessity that our earth and its sister orbs are all winding spirally towards the sun, and that they must eventually strike against it and become incorporated with its mass. The time required for this purpose belongs to those inconceivable periods with which geology and astronomy have to deal. The resisting medium is so exceedingly attenuated that it exerts but a slight influence on the comets, which are themselves masses of the very thinnest vapor, and its influence would of course be very much less on the dense matter of the planets. Astronomical observations, with all their wonderful delicacy, have yet failed to detect the slightest progressive shortening in the periods of revolution of any of the planets. It is curious, however, to note the multiplied obstacles which prevent the perception of this fact, if it does exist. All the *measures* of these revolutions are shortening with the revolutions themselves. If we begin, for instance, with the earth, the problem is to ascertain whether the time occupied by the earth in its journey around the sun is gradually becoming shorter. The first plan that suggests itself is to compare this with the rotation of the earth upon its axis, to see whether the year occupies the same number of days and hours and seconds that it did in former times. But if the earth is gradually cooling, it is contracting in size, and its rotations on its axis are becoming more rapid; in other words, the day is shortening with the year; and if the measure shrinks just in proportion to the thing measured, we cannot tell whether the latter is becoming shorter or not. If we take the time of the revolutions of the moon around the earth as a standard, the same resisting medium would draw the moon towards the earth and shorten the month also with the year. If we resort even to the less satisfactory measure of the sun's rotation on his axis, his bulk is also diminishing by the radiation of his heat, and the period of his rotation is consequently becoming shorter. In brief, from the two causes of radiation and the resisting medium, all the times and distances which could be used to measure the earth's distance from the sun (or the period of its annual revolution) are shortening together. So that the *differences* in the extent of these several contractions are the only means left for detecting by observation the approach of the earth to the sun, if such approach is really taking place. These differences would doubtless reveal themselves in the course of generations to refined astronomical observations.

If the earth and the sun are gradually becoming cold, this winding of the earth towards the sun would tend to keep up its warmth, and it may be a wise provision for prolonging, by some millions of years, the continuance of animal life upon our globe. But this period must come to a close, for if there is a resisting medium pervading the space between us and the sun, the final destiny of the earth is to curve gradually inward till, with a velocity hundreds of times greater than that of a cannon ball, it dashes itself with an awfully sublime crash into the mass of the sun.

ROOM FOR IMPROVEMENT IN THE STEAM ENGINE.

The unit of heat is that which is sufficient to raise the temperature of one pound of water by one degree of Fahrenheit. The unit of work is the raising of one pound weight through a vertical hight of one foot—called a foot-pound. The experiments of Mr. Joule, of Manchester, indicated that if the whole of the heat could be rendered available, a unit of heat would raise 772 pounds one foot high; in other words a unit of heat is equal to 772 foot-pounds. This is called Joule's equivalent. A pound of charcoal will raise 78.15 pounds of water 180 degrees, which is equal to 14,067 units of heat. This multiplied by 772, gives 10,859,724 foot-pounds, which is equal to the production of 5½ horse power from the combustion of one pound of charcoal per hour. As the best engines consume nearly two pounds of coal per horse power per hour, it follows that only about one tenth part of the gross power of the fuel is utilized.

OUR SPECIAL CORRESPONDENCE.

OHIO MECHANICS' INSTITUTE FAIR.

CINCINNATI, Ohio, Sept. 15, 1860.

MESSRS. EDITORS:—For seventeen years in succession, the exhibition halls of the Ohio Mechanics' Institute have been thrown open to the public of the Queen City. In that time how many inventions now in general use, have been first timidly offered for public inspection under its auspices, and how many others which were sprung upon that public with specious promises of utility have died the natural death of humbugs, who can tell? These institutes for the aid of artisans are so many nursing mothers of genius, talent, industry, and mechanical skill; and it is safe to say, that no one which has been managed as this one has, could have lived through a seventeen years succession of annual displays without becoming a national blessing. We all remember the rich young girl in Sue's "Mysteries of Paris," who so honored the artisans who fashioned her costly silver vases, and furniture, and carriages and other things, that she allowed only their names, and not those of their employers to be inscribed upon them. So at these public displays of mechanical skill, the real worker may reap the honor due him for his work, before he loses his individuality in the shadow of the large manufacturer who may employ him.

The number and variety of articles on exhibition at the Institute this year, are said to much exceed those of the last; while there are some things of novel design and peculiar merit. Of course, it would be impossible to compress within the limits of a newspaper article, fair or even unfair notices of the mass of inventions on view; all that can be done is to note in meager outline those which attract attention as we thread our way through the maze of moving machinery and stationary things.

The exhibition was held last year in a building, constructed under the direction of the committee, entirely of gas-pipe; and this novel structure which rose to the astonished view of the Cincinnatians, like some palace of Alladin, was sold after the fair, for a goodly sum. This year the directors secured three floors of the Catholic Institute, and the hall of the Mechanics Institute which adjoins it. There are several rooms devoted to machinery and manufactured articles; a long and spacious picture gallery, well filled with some pictures of all the fashionable styles, and oil pastel and crayon pictures by resident artists; and, at the top of the building, a grand concert room of magnificent proportions, all filled with articles of use. In the center of this vast saloon water jets in ceaseless flow from a fountain of graceful shape, and the echoes of the plashing drops ring along the arched ceiling and through the room with pleasing effect.

As we enter the main door of the first machine room on the lower floor, our attention is first attracted to three single cylinder printing presses from Wells' type-foundry, and to some beautiful fire proof safes from the shops of Dodd & Co., and Hall, Caryl & Co., which are finished with bronzing and flower painting to a degree that I never saw equaled. The exhibitor representing one of these firms, expressed an ardent wish to come in competition with our leading New York safe men, and remarked that it somehow strangely happened that none of them cared to venture on here with the goods to show against them. It may be that Lillie and Herring will say, as Morrisey does to Heenan, that if they wish to stir up a combat, it will only be necessary for them to give the provocation.

Almost every visitor as he moves along, stops to see the practical operation of Hill's and Porter's governors, which all through the evening are kept whirling around like dancing dervishes. Porter's is a centrifugal governor on a new principle, as all readers of the SCIENTIFIC AMERICAN will recollect, for it has been illustrated and