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OUR WORK AND ITS RESULTS.

The SCIENTIFIC AMERICAN has now been in existence upwards of twenty-four years. From a small beginning it has grown to a large and prosperous enterprise, and its weekly issues reach every latitude and longitude where the English language is read. Its aim has been from the first to stimulate inventive talent, to educate the masses and familiarize them with the great landmarks of science, to give the earliest information in regard to discoveries important in their industrial applications, or likely to become so, to discuss general topics relating to health and the welfare both of individuals and society, and to aid in the development of the great industrial resources of this country, which, when the first number of this journal was published, had but scarcely emerged from an embryonic condition into permanent prosperity and enlargement.

The extent to which these resources could be developed were but dimly recognized by the statesmen of that day. The vast network of railroads which was to cover this continent had only been commenced. The first electric-telegraph line, as now employed, had just been erected, and its brilliant history had yet to be written. The art of daguerreotyping, from which was to spring such immense results, had but just been introduced into the country, and in all departments of the arts and manufactures there remained a wide field for improvement and invention.

We may, without assumption, claim to have done much towards the rapid onward march of improvement since that period. The records of the United States Patent Office will show that of all the patents issued a very large share has been taken out through our agency, and the history of these inventions would doubtless show that many of them originated either in some want made known, or information imparted through our columns.

Since the commencement of the SCIENTIFIC AMERICAN, many branches of industry have been created, and old ones have been revolutionized. The severe labor of the farm has been superseded by the work of most admirable and efficient machinery, the value of which to the world it is impossible to estimate. The sewing machine, that marvel of mechanical skill, has added its help to modern progress, and the metallurgic arts have extended beyond what the boldest prophet would at that time have ventured to predict. The printing-press, that great disseminator of light and knowledge, has also had its capacities more than doubled, and electro-typing has become general.

The records of our office show that in all these great improvements our readers and clients have played an important part, and that the inference is just that the SCIENTIFIC AMERICAN has done more to advance the industrial interests of the United States than any other journal ever published in the country.

Begun at a time when scientific information was very sparsely diffused among the masses, it has grown with the distribution of such knowledge, until it now circulates more widely than any similar journal published in the world. It has made this vigorous and healthy growth against much competition, and has succeeded because it has steadily striven to deserve success.

We are fast approaching the close of the seventh decade of the eighteenth century. This period is crowded with the most remarkable events of American history. It has witnessed the connexion of the two hemispheres by telegraphic

cables, and of the two great oceans by the Pacific Railway. The origin of these great works was American, and they have, to a large extent, been carried to successful and unprecedentedly rapid completion by American enterprise. The next ten years will witness the birth and maturity of other giant enterprises and will be crowded with important discoveries. With all future progress we shall, as we have in the past, endeavor to keep pace, and our readers may depend that no effort will be spared to make and keep the SCIENTIFIC AMERICAN the leading paper of its class. The more extended our circulation the better shall we be able to perform this task, and if our friends and patrons second our efforts, as they have hitherto done, and our subscription list shall continue to increase in the same ratio for the coming ten years as it has done since 1860, we shall enter the year 1880 with one hundred thousand subscribers.

MECHANICAL ACCURACY.

The attainment of even an approximation to mechanical accuracy is a matter of great difficulty; perfect accuracy is unattainable. This is, however, trite and well understood by mechanics in general; the reasons are not so well understood.

Why is it not possible to make two things precisely alike? In vain the painter essays to reproduce a picture, or the sculptor to remodel a statue. In vain the counterfeiter strives to engrave a bank-note plate which will exactly resemble the one he attempts to imitate. He may, in some rare instances, succeed so well as to deceive all inferior eyes, but he himself can perceive defects, and these defects cause him many fears and anxieties that others will discern them. Go to any heap of newly-struck coins, you can find no two which exactly resemble each other. The joiner lays out his work with the utmost care, and works to line as nearly as possible only to find that when the parts come together a shaving must be taken off here or a joint is open there; some imperfection mars his work let him do the best he can.

Now there must be some fundamental reason for this. What is it?

We find upon close analysis two physiological causes at work to prevent regularity and uniformity in anything we do. One is imperfect sensation, the other imperfect command of muscles. It is only by cultivating in the highest degree the senses, and disciplining the muscles to become as much as possible subordinate to the will, that the artisan becomes skillful. These things accomplished, the physical education of a workman is completed; all other things requisite may be acquired without manual practice, but practice alone can perfect sensation and give power to the will over muscular motion.

It may be said that much of the imperfection of workmanship arises from imperfections in implements; but it is easy to trace these imperfections to defective sensation and execution. It has only been by a gradual division and reduction of imperfections, that we have obtained more perfect tools than savages use. From the stone used to crack nuts to the steel hammer of the present day a great many slow steps have been taken. How wide the difference between the auger and drill of modern times and the stone drill of the ancient races of North America; yet this difference has been attained by slow progression. Even yet our most delicately constructed instruments are not quite perfect.

The two senses most to be charged with imperfect workmanship are sight and touch, but sight betrays us far more than all the others put together.

In astronomical observation the habitual error in recording the instant of an astronomical event is ascertained as nearly as possible, and the formula expressing it is called the *personal equation*. This is allowed for in reducing all observations, and will generally be found pretty nearly constant. It amounts in some cases to one half a second.

The British mint allows twelve grains to the troy pound for variation in weight in coining; and this may be taken perhaps as the measure of the nearest approach to mechanical accuracy in coining. It is fifteen seventy-seconds of one per cent.

But there are other causes which lead to imperfection in workmanship not yet named. The variable textures of the materials used and the different thermometric and hygrometric conditions both of materials and tools, all tend to defeat accuracy. There are scarcely any two days in the year when a boxwood rule is precisely of the same length, and the variations in metallic rules are even greater than in those of wood. In very accurate drawing the draftsman finds it necessary to make a scale on the same paper as that upon which the drawing is made, that the hygrometric expansion and contraction of the paper may not mislead the workman. Surveyors find errors creeping into their measurements from the expansion of their chains; and we might go on to show that no material or implement can be made entirely free from one or the other of these adverse influences; while many are subject to both.

By clearly recognizing these facts, and with a full knowledge of the nature of materials and how they are affected by heat and moisture, the mechanic may attain very much greater accuracy than would otherwise be possible, no matter how skilled may be his eye and hand; and it has been by attending to these nice points in combination with skill in other particulars that the *chef-d'œuvres* of handiwork have been achieved.

DEATH OF INVENTORS.

We regret to announce the death of Mr. Paul A. Sabbaton, which took place at Albany on the evening of Nov. 1st. Mr. Sabbaton was a distinguished gas engineer and inventor, and resided formerly in New York. He was an esteemed client, and at one time a frequent contributor to the SCIENTIFIC AMER-

CAN. He had reached the advanced age of eighty-one years. We also regret to announce the death of Mr. Otis Tufts, of Boston, an inventor of considerable note. He was the builder of the iron steamer, *R. B. Forbes*, and one of the improvers of the steam engine. He invented a power and a hand printing press, the latter of which is still in use; and he was the inventor of an excellent elevator for hotels, stores, etc., which has been extensively used both in America and Europe.

WHAT WILL YOU DO WITH YOUR EVENINGS THIS WINTER?

Winter is fast approaching. Already it has sent out its skirmishers, in the form of stinging winds, and bitter snowsqualls. With it will come long evenings of leisure. Young men, what do you intend to do with these evenings?

There are a thousand inducements to squander them. The gayly lighted billiard-room, opens its doors and invites you to enter. The theater, the ball, solicit you. All sorts of similar temptations allure you to spend your time and money; and many of you will be drawn into extravagant expenditure, by these, in themselves, innocent amusements.

Another and worse class of temptations will beset you. The drinking saloon, the house of ill-fame, will invite you to enter, and with delusive excitements seek to blind your moral perceptions and lead you to ruin.

What are you going to do with these precious evenings? Will you throw away their golden opportunities, and take upon you a burden of vain regret for the years that are to come? Do you not see their value, if improved?

There are thousands of young mechanics who will see these words, and will, some of them, perhaps, resolve that *this* winter shall not be spent as was the last. This winter shall be devoted to neglected arithmetic, algebra, or book-keeping. They will seize the coming leisure to perfect their knowledge of drawing, or to complete their perusal of some scientific, historical, or literary work begun long ago, but still unfinished. They know the value of time and they will no longer squander it.

Alas! how few of these wise resolutions will be kept. Yet we are hopeful that some will be influenced by our exhortation to use their time in a more profitable manner than do the majority of pleasure-loving young men.

The means of self-improvement are now so widely diffused that no one seeking knowledge can fail to obtain them, and while we do not counsel the utter renunciation of innocent amusements, it is always wisdom to subordinate these things to higher purposes.

Young mechanics, and young men of whatever occupation you may be, you may refer your future success or failure to the way in which you employ this winter's leisure. Then what will you do with your evenings?

A HUGE JOKE IN BRASS.

The age of bronze has returned, although this time it manifests itself in morals rather than in mechanics. Mr. Cornelius Vanderbilt is a rich, shrewd financial operator, full of years, and—we were about to say wealth, but his still eager pursuit of dollars shows that, like *Oliver Twist*, he yet asks for "more." He is not full of honors, or at least was not, until the tenth instant at one P. M. when, as Mrs. Partington would say, his "brass figger" was unveiled to the world, and simultaneously inaugurated at the Hudson River Depot and the Stock Exchange.

Many celebrities were invited, but few assisted at the ceremonies at the depot. Many celebrities were not invited, but many were present at the Stock Exchange. Enthusiasm rose to the highest pitch at the absurd burlesque performed by Van Schaick and his *confreeres* at the latter place, while at the equally absurd ceremonies at the depot it sunk to zero.

As our readers are aware, the depot is a large and commodious store house for the Hudson River Railroad freights, recently erected on the site of the old-time St. John's Park, formerly an aristocratic portion of New York city. Upon this building is placed the statue which is reported to have cost an immense sum of money.

An inaugural speech was made by Mayor Hall which reads as though his Honor—who is a philosopher and wit—must have meant to be bitterly ironical. When the canvas was removed from the statue, the sailors stationed on the roof of the depot to pull up the curtain took off their hats and cheered some, while a few straggling "Hurrahs!" terminating in that peculiar cadence indicative of the absence of enthusiasm and carelessness to conceal the want, found vent from throats below. It is evident that the people do not love Vanderbilt intensely, and that the names of such philanthropists as Peabody, which Mayor Hall saw fit to associate with that of Vanderbilt in his fulsome eulogy on the great waterer of stocks, could not avail to wring a hearty cheer from the people at the show.

Of the statue itself as a work of art there is not much to be said in the way of commendation. The Commodore stands erect, arrayed in a driving coat of fur, ample to protect from frost a Siberian sledge driver. The surrounding *bas reliefs* are absurd, and in many respects ridiculously so. The position of the statue is badly chosen. The street is too narrow to afford a proper view of it. The figure appears to be making a bashful attempt to step out of its sheltering niche as if afraid of too much publicity. The *bas reliefs* portray immense birds more prominent than the ships and locomotives, and apparently struggling to fly away with the whole design.

The two trains of cars appear to move on very dangerous curves, suggesting the probability of an impending smash up. The bronze locomotive has its boiler and piston-rods apparently bent to fit the crook of the rails. The derrick in front of the locomotive is out of proportion, and would more prop-