

## HOW WE SAVE TIME AND LABOUR.



GEORGE STEPHENSON'S BIRTHPLACE.

HERE is a certain phrase much in use amongst political economists just now—"The maximum of result with minimum of effort." We might call it trade's text, and we might call our great industries illustrations of that text. In these noisy, busy days, when every man seems to work

more intensely, and every wheel seems to go faster, and when one would imagine that the very earth was turned by steam, it is not always easy for us to stop to perceive how much work we are all the while saving. In a page or two it may be possible to indicate the labour-saving tendencies of this laborious age.

Strength is like a tool, good for much or little as the handler is good for much or little. The pen that with a hard day's work earns the clerk a few shillings might, in an artist's hand, produce fifty pounds with a few scratches. People pay far less for what they see than they pay for what is not seen. When they buy a book, they get more than paper and print; when they pay thousands for a painting, they buy a few square feet of canvas, paint which may have cost a shilling or two, stucco and gilding, and brains—with which Opie and all his fraternity mixed their colours. Those who have no brains become machines in the hands of those who have brains. The simple labourer plods on his way on foot; but the man of brains comes riding past, and gives him a seat behind him. The farmer who gathers his twenty or thirty men of a morning, and sends them about various kinds of work, has been thinking for every one of them, and so has saved each a certain amount of time and trouble. Brassey, in the course of a forenoon, thought and wrote enough to keep large armies of workmen steadily engaged for many days. Or look at London. The proverb has it, "All roads lead to Rome;" but trade snaps its fingers at that old-world saying; all roads lead now-a-days to London. When Londoners speak of the City, they mean a cluster of streets and buildings that may easily be traversed from side to side in a few minutes. The City is like the heart, or better say the brain, of the world. In that subdued, intense hum, you hear the world thinking. Nothing but thinking goes on here. No bales of cotton, no chests of tea, no sacks of grain, no loads of timber are to be found in the City—few workmen of any kind, only those who can think. These City men do most

of the thinking for the great companies of the world—the railway companies in the far West, or in Russia, or in India; the submarine telegraph companies; the trading companies in North America, or in Africa, or on the Nile, or in China and Japan; the gas companies and the water companies in Berlin, or elsewhere; the ocean steamship companies; the mining companies; and hundreds of such schemes. Now, the world pays these men to think, and pays them better than any others, because they really do the most work and save the most time—best exemplify the maximum of result with the minimum of labour.

Turn now to the work of still stronger, though not always more highly-paid, thinkers. By the agency of science coal is taught to spin, weave, dye, print, and prepare silks, cottons, woollens, and other cloths; it makes paper, and prints it when made; it converts corn into flour; it presses wine from the grape and oil from the olive; it draws metal from the bowels of the earth, pounds it, smelts it, melts it, moulds it, forges it, rolls it, twists it into any form the imagination can devise. A bushel of it can be made to do the day's work of 200 stage-coach horses. The Great Pyramid of Egypt measures 700 feet across the base, and is 500 feet high; its construction employed 100,000 labourers for twenty years, and it is the puzzle of history to divine the means employed to raise the enormous blocks of stone. Now we know that the whole of its materials might be raised to their present position, at the expense of not more than 480 tons of coal. The Menai Bridge consists of about 2,000 tons of iron. It is said that its whole mass might be raised from the level of the water to its present height—210 feet—by the combustion of four bushels of coal!

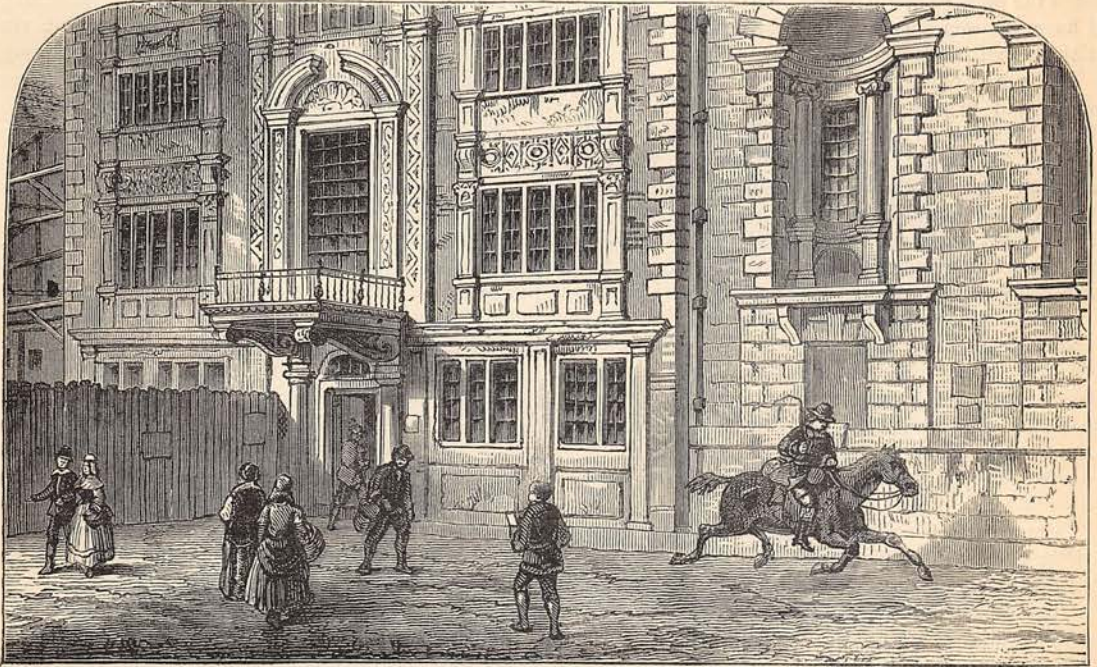
Consider what science, with iron, and coal, and steam for helps, accomplished for us in the railway alone. "Man," says Carlyle, "digs up certain black stones from the bowels of the earth, and says to them, 'Transport me and my luggage at the rate of five-and-thirty miles an hour;' and they do it." In 1671, Sir H. Herbert, speaking in the House of Commons, said: "I honestly confess myself an enemy to mad, visionary schemes, and I may be permitted to say that in the late King's reign several of those thoughtless inventions were thrust upon the House, but were most properly rejected. If a man, Sir, were to come to the bar of the House, and tell us that he proposed to convey us regularly to Edinburgh in coaches, in seven days, and bring us back in seven more, should we not vote him to Bedlam? Surely we should, if we did him justice. Or if another told us that he would sail to the East Indies in six months, should we not punish him for practising on our credulity? Assuredly, if we served him rightly." It was perhaps well for James Watt that Sir H. Herbert did not live in his day! Who has not heard of the ridicule cast by the *Quarterly Review* for March, 1835, upon a proposal to carry passengers from London to Woolwich in steam-

coaches, at the rate of eighteen or twenty miles an hour? "We should as soon expect"—these were its words—"the people of Woolwich to suffer themselves to be fired off upon one of Congreve's rockets as trust themselves to such a machine, going at such a rate."

And now sixty miles an hour is daily attained by certain trains! We smile as we read these words of Smith: "A broad-wheeled waggon, attended by two men, and drawn by eight horses, in about six weeks' time carries and brings back between London and Edinburgh near four ton weight of goods." Thus what he took to be the hare we discover to be the tortoise.

The railway has been the great civiliser, the great time-saver of the age. But the sister—the electric

Upon their separating from one another into distant countries, they agreed to withdraw themselves punctually into their closets at a certain hour in the day, and to converse with one another by this their invention. Accordingly, when they were some hundred miles asunder, each of them shut himself up in his closet at the time appointed, and immediately cast his eye upon the dial-plate. If he had a mind to write anything to his friend, he directed his needle to every letter that formed the words that he had occasion for, making a little pause at the end of every word or sentence, to avoid confusion. The friend, in the meanwhile, saw his own sympathetic needle moving of itself to every letter to which that of his friend pointed. By



THE OLD POST-OFFICE IN LOMBARD STREET, ABOUT 1800.

telegraph, sharp, quick-witted as her brother is powerful—has done nearly as much for us. The two have always worked hand in hand. It is curious to observe how what is often regarded as chimerical in one age becomes reality in the next. "Strada," says Addison in 1711, "gives an account of a chimerical correspondence between two friends by the help of a certain loadstone which had such a virtue in it that, if touched by two several needles, when one of these needles so touched began to move, the other, though at ever so great a distance, moved at the same time and in the same manner. He tells us that two friends, being each of them possessed of these needles, made a kind of dial-plate, inscribing it with twenty-four letters, in the same manner as the hours of the day are marked upon the ordinary dial-plate. They then fixed one of the needles on each of these plates in such a manner that it could move round without impediment, so as to point to any of the twenty-four letters.

this means they talked together across a whole continent, and conveyed their thoughts to one another in an instant over cities and mountains, seas or deserts." A curiously prophetic dream this. Now we send our thoughts, not only through cities and over the hills, but under the sea. Even when our theory of telegraphy was tolerably perfect, it was for long considered a feat to communicate along a wire twenty miles long; and this could only be done in very dry weather. In the present day we pass messages through 2,500 miles of wire without a break. The result of the last Derby was telegraphed from the course to New York in a few seconds. You can order your hamper of wine from the London merchant in three minutes for a shilling; soon you may do it for sixpence. Many London housewives order their butcher's-meat or their groceries by means of district telegraph wires, the cost of the operation being so small that the tradesmen gladly bear it.

"If," says the projector of an "accelerated post-service," in 1635, "anie of his Ma<sup>ty</sup>s subjects shall write to Madrill in Spain, hee shall receive answer sooner and surer than hee shall out of Scotland or Ireland. The letters being now carried by carriers or foot-posts 16 or 18 miles a day, it is full two months before any answer from Scotland or Ireland to London."

A vivid glimpse of posting times before this is gained in a letter of Tuke, Postmaster in the time of Henry VIII. "As to postes betwene London and the courte, there be now but 2, whereof the one is a good robust felowe, and was wont to be diligent, evil entreated many times, he and other postes, by the herbigours, for lack of horse rome or horsemete, withoute which diligence cannot be. The other hath been the most payneful felowe, in nyght and daye, that I have known amongst the messengers. If he nowe slak he shalbe changed, as reason is."

As soon as regular posts were established, the people were glad to support them. Cromwell farmed the Post Office for £10,000 a year; Charles II. farmed it for £21,500 a year. In the next century, when mail coaches were introduced, the number of letters passed through the Office in a certain year was 75,907,572; and the net profit upon carriage was £1,659,509. We all know what increase even upon this large traffic the Penny Post brought. One curious and beneficial result not contemplated by Sir Rowland Hill when he introduced stamps was their use as a medium of exchange. Bankers disdain the copper, but Government has issued a paper currency representing the despised coin, and that currency is in large circulation among the humbler classes. I believe the number of letters passed through post offices last year amounted to about 600,000,000.

The perfect economy of machinery on which we pride ourselves in this country is the strongest proof of our vehement desire to save time. The amount of time spent—often apparently wasted—in the very endeavour to *save* time is incalculable. When Howe, instead of earning a fair mechanic's wage, spent years in the most abject poverty conning the problem of the sewing-machine, most people looked upon him as a very unproductive member of the community. But who can tell how many seamstresses' lives would be worn out in performing the work one of his machines does in a year or two? The wheel, the lever, the pulley, or the wedge enables a single man to do what twenty men might not do without its aid. When we spread the sails of the windmill, we simply set the air to do work; and it does it, with scarcely any attention on our part. When we construct a water-wheel, we are enabled with it to make the patient stream save time for us night and day if we will. The knotted root of a tree might be divided by a stone, better by a knife, a hatchet, a saw, a wedge, but best by gunpowder or dynamite. Each of these methods exemplifies improved economy of labour and time. We have so long been accustomed to use constantly the most complicated and costly machinery that we often forget what we owe to it, as well as to that which is simple and cheaper. The

truth is, we cannot snuff a candle, mend a pen, cook a pudding, without resorting to machinery or tools of some sort. Our civilisation and prosperity as a nation are largely the result of the perfection our insular position has enabled us to bring machinery to. What has enabled us to avoid the increase of public debt so many great economists predicted for us, but our improved means of production? While our population has increased, our skill has increased, thanks to such men as Hargreaves, Arkwright, Watt, Wedgwood, Crompton, and Cartwright. It was said, forty years ago, that by means of improved machinery an individual could produce then 200 times the quantity of cotton goods one was able to furnish at the accession of George III., in 1760. It is not going too far to say that we have derived ten times the advantage from the spinning-jenny and the steam-engine that we have obtained from the conquest of India, though by this latter we added nearly 100,000,000 subjects to the Empire. I have seen it stated that the Indians of South America have no other method of making cloth than by taking up thread after thread of the warp, and passing the woof between them by the hand. Thus they are engaged for several years in the weaving of hammocks, coverlets, and other coarse cloth articles, which a European loom might turn out in a few hours. It was not by chance the Greeks ascribed the arts of spinning and weaving to Minerva; they are among the most honourable testimonies to the sagacity of mankind.

Take a few of science's advances in this century alone. A certain Mr. Isaac Holden, lecturer on chemistry, having bethought him of means to insure the quick lighting of a candle, since at four in the morning—the hour he rose at for study—flint and steel proved somewhat irritating, succeeded in uniting wood with chemicals long known to be capable of affording instantaneous light. He mentioned his experiments and their results to his class. One of his students communicated to his father, a London chemist, the information thus given, and lucifer-matches were shortly in the hands of all. One manufacturing firm alone now produces 3,000,000 matches every day.

We have already mentioned the railway, the telegraph, the penny post: the year 1800 had not heard of these. Since then we have been presented with india-rubber and gutta-percha articles; ships have been furnished with screw-propellers; photography has taught us how ugly we are; gun-cotton has shown us an easy way to destruction; steam-ploughs, and reaping-machines, and raking-machines, and road-engines, and tram-cars, and pneumatic tubes have unfolded their powers. England is within ten days' travel of America; we have touched the magnetic pole; Egypt has been disinterred; planets have been discovered; our ancestry has been alarmingly traced; our earth has been proved older than was supposed by some 20,000,000 years. In 1812 the *Comet* was the only steam-ship plying in the United Kingdom—now we have a fleet of some 3,000. Of turnpike roads, canals, railways, there have been formed over

130,000 miles. Montgolfier, studying his coffee-pot as Watt did his kettle, practically founded what is worthy to be termed not only the art but the science of aeronautics, capable of great things in the future. Our fathers cut their own pens out of goose-quills—now we obtain annually from Birmingham alone at least 1,000,000,000 metal nibs. A needle once cost as much as a shilling—that coin to-day buys 100 of the best. Think of the Menai bridges, the Fribourg bridges, the St. Lawrence bridge, the Forth bridge! That good old gentleman we mentioned a little ago, Sir H. Herbert, when he made the remarks quoted, had risen in the House of Commons to denounce as chimerical a scheme to bridge the Thames at Putney!

In 1801 the quantity of raw cotton consumed in this country was 54,000,000 lbs.—now it approaches 2,000,000,000 lbs. In 1860 Mr. Samuel Maverick, of South Carolina, who assisted in packing the first bag of cotton sent to Liverpool from America, was still living—he may be alive yet. In that same year, 1860, the number of exported bags was computed by him to be 2,500,000. I heard it said lately that the civilisation of the country might be computed by the amount of sulphuric acid it consumed. The powers of sulphur are the discovery of this century; it is the great requisite for colour-making in all forms, dyeing, paper-making, bleaching, medical preparations, instruments of war, and many arts. With sulphuric acid the chemist makes nitric acid, hydro-


chloric acid, phosphorus, chlorine, and many other things. Not so long ago sulphuric acid was half-a-crown per pound—now it is a penny.

But lately we have learned to utilise much that was regarded as refuse. Glycerine was looked upon by chemists as a nuisance, to be got rid of at great expense—now it is the most valued friend of the candle-maker, and is likewise used by the dispensing chemist. Soda, formerly made from Highland kelp and Spanish barilla, is now to be got in unlimited quantities from ordinary sea-water. Bones are ground into manure. The refuse of gas-works furnishes ammonia; and from the same source we obtain carbolic acid and aniline dyes. Old rags form some of our most beautiful furniture. A church in Norway, adorned most elaborately outside and inside with statues and Corinthian capitals, is composed entirely of papier-maché.

Aluminium was discovered in 1827. Although it is yet a most expensive metal, the fact that its oxide is the chief ingredient of all common clays inspires chemists with the hope of making it “as cheap as dirt.”

In navigation, science has made rapid strides during the last eighty years. Wind and tide charts, deep-sea sounding, and the like, have been skilfully executed. The compass, more particularly in iron ships, is being made more truthful every year. The *Sirius* and the *Great Western* achieved the passage of the Atlantic just as Lardner had finished to his own satisfaction a proof that such a passage was impossible. E. S. R.

## CHILD OF THE CITY.

 CHILD of the city, drooping flower,  
With wistful eyes and mournful brow,  
I've sought through many a lovely bower,  
Yet found no sweeter flower than thou.  
I love thee more because thy cheek  
Hath oft been dimmed with sorrow's tears,  
And hush my heart to hear thee speak  
With wisdom far beyond thy years.

Child of the city, captive bird,  
Caged in the busy mart all day,  
Where trill of thrush is never heard,  
Or soaring skylark's rapturous lay,  
As soars the lark from worldly things,  
Thy pure thoughts soar beyond the stars;  
Poor fluttering bird with tender wings  
That feebly beat thy prison bars!

Child of the city, not for thee  
The thousand joys to childhood dear;  
Thy longing eyes may never see  
The leaves, the young fresh leaves, appear.  
The buoyant hope thou mayst not know  
That thrills the little rustic lass  
Who stands, with sun-kissed face aglow,  
Knee-deep amid the whispering grass.

Child of the city, in thy dreams  
Fair smiling fields, green winding lanes,  
Fresh summer winds, bright glancing streams,  
And children weaving daisy-chains,  
Are all thine own: thy weary feet  
Half fearful press the wondering flowers;  
Nor memory dark of crowded street  
Dares to invade those rapturous hours.

Child of the city, from the trees  
Laden with bloom the blossoms fall;  
In fairy music sings the breeze,  
And from the woods the wild birds call.  
The sunlight falls like golden rain  
From the unclouded sky above,  
While Nature sings one heavenly strain  
Of grateful joy—"Oh, God is love!"

Child of the city, worldly wise  
Ere yet thy life hath reached its noon!  
Sweet pensive brow, sad wistful eyes—  
Wee world-worn heart grown old so soon!  
Be patient still, be strong, be brave,  
All shadowed though thy lot may be;  
Fix all thy hopes beyond the grave,  
Where flowers immortal bloom for thee.