ment, enlarged the area of his work, until he is now one of the greatest railway contractors of to-day.

There is another method of fortune-making—that of the utilization of products that were wasted : a method which has in it the elements of many a romance. The story of Mr. Lister—now Lord Masham—and the silk waste that was sold for rubbish, that led to the investment of a quarter of a million sterling in machinery for converting it into fabrics costly and beautiful, has been well told ; the allied story of Sir Titus Salt and the alpaca is even better known. Out of hydrochloric acid—once wasted in the production of soda—the fortunes of the Tennants of Glasgow grew ; and, very recently, the "Chance-process" for the utilisation of alkali-waste in the production of a very pure sulphur appears to be yielding golden results. Mining and shipping are branches of commerce and adventure that have often led to fortune, but that cannot be even briefly touched upon here, though the stories of success and failure are almost as romantic as the tales in the Arabian Nights.

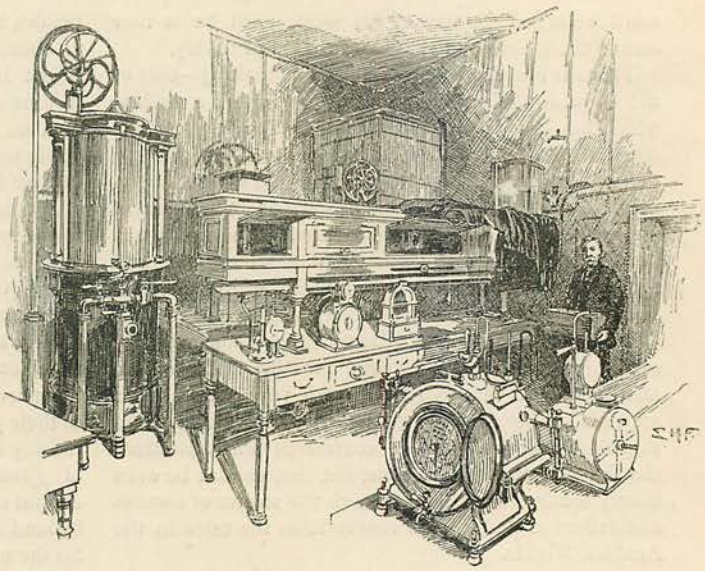
A very natural and a very fitting question is this—Does the result justify the effort ? The reply is—That depends on the use made of the fortune. One millionaire who died recently lived "only to make money," the words quoted being those of a near kinsman, who is his executor. Another merchant who partly made and partly inherited a fortune very differently uses his wealth. His income is now assured : it is about £4,000 yearly, one-half of which is given to religious, philanthropic, and charitable objects, and the other half is devoted to personal and family use. Does the result justify the effort ? In the training of mind to judge of results, in the endeavour to win success in a race that is open, there are developed powers that otherwise might lie dormant ; so that the exercise needed in fortune-seeking, and the full use of powers and faculties, are in themselves desirable, but the acquirement is really tested in its usefulness by the way in which the fortune is used.

Fortunes are probably more rapidly made now than formerly, and so there is the more opportunity for the wise use of the acquired gold. As commerce is enlarged, the uses of wealth are greater and more potent, the interest larger. The early bankers (Childs and others) carried on business under their old-fashioned signs on a comparatively small scale ; but now the "turn-over" of the modern banks is millions where that of their predecessors was thousands. The first public railway had a total subscribed capital, at its inception, of £120,900 ; but its successor has now a paid-up capital of £60,300,000. The great carrying companies by land and sea have enlarged the area of investments. So the making of fortunes is expedited, the telegraph and the steamship, quickening communication, aid in the more rapid use of capital, and stimulate its growth. It is probable that more rapid accretion and quicker dispersal of fortunes will lessen the danger of acquiring that "love of money" which Scriptural authority and many a modern proof show to be the root of evil. Those who, in Burns's phrase, "assiduous wait" upon Dame Fortune are now more rapidly repaid, and with health of body and brain, and with the desire to seize opportunities as well as to wait patiently and search diligently for them, fortunes are more easily made in most occupations than they used to be in the past.

CONCERNING THE STANDARDS.

In a quiet corner of Old Palace Yard, right under the shadow of Westminster Abbey, there modestly hides one of the most interesting of the Government offices. The Standards Department of the Board of Trade, which has long been there located, is in singular contrast to most other branches of the State, for it is of antiquarian and scientific, as well as of practical, value. One of its distinctive features is the museum, which contains many curious relics, ancient and modern, illustrative of our system of weights and measures The most ancient standard here preserved is a small bronze weight, contained in a conical box, which is inscribed "*grana pro auro*." This is believed to belong to the time of Edward I. It was used as the standard pennyweight in the fourteenth century. The standards here which rank next in age date from the reign of Henry VII. These include an octagon yard-measure, marked "H," and having lines roughly cut in it, denoting $\frac{1}{16}$th yard, and also inches. This standard is probably the same length as the old standard yard, and is only $\frac{1}{100}$th of an inch shorter than the present Imperial standard. Close at hand are also the standard corn bushel and corn gallon referred to in Act xii. Henry VII. cap 5, viz., "It pleaseth the King's Highness to make a standard of a bushel and a gallon to remain in his said Treasury for ever." These are manufactured of gun-metal, and are elegant examples of founders' work of the period. There are no standard weights at Westminster of the time of Henry VII., but in the Albert Museum at Exeter there is preserved an old Exchequer 14 lb. avoirdupois weight of that monarch's

reign. In the Harleian MS. at the British Museum there is a copy of an ancient table of weights and measures of the time of Henry VII., which was hung on a wall in "Ye Star Chambre" at Westminster. From that table it appears that the scale of avoirdupois now in use is precisely the same—viz., 1, 2, 4, 7, 14, 28, and 56 lbs. It would seem that there was more uniformity of measurement during the reign of Henry VII. than in the time of Queen Anne and George II. In pursuance of the commands of Queen Elizabeth, new standards of troy and avoirdupois weight were constructed by a jury of Goldsmiths of the city of London in the year 1574. Their verdict may be seen at the British Museum. According to the royal proclamation, the weights then used were uncertain, "to the great slander of the realm and decency of many, both buyers and sellers." Queen Elizabeth's standards include troy weights from 256 ozs. down to ½th oz., and avoirdupois standards from 112 lbs. down to 1 lb. Copies of these were sent to the principal towns, and all persons were required to use weights agreeing with them. The royal proclamation containing this order was directed to be read during service at every church twice a year for four years. There are also at the Standards Office the Exchequer yard and the Exchequer ell (dated 1601), together with the matrix or bed for them; likewise standard measures of capacity, consisting of the Winchester bushel and gallon for grain, and the standard ale quart of Queen Elizabeth. Coming down to the time of Queen Anne, we find that in 1707 a new standard wine gallon was legalised owing to disputes as to the legal contents of that measure. At that period the ancient practice declared by Magna Charta was reverted to—viz., "there shall be throughout our realm one measure of wine, and one measure of ale, and one measure of corn." This standard is made of bronze, and is of elegant casting.



STANDARDS DEPARTMENT, BOARD OF TRADE. GAS-TESTING APPARATUS—PHOTOMETER ROOM.

CORNER OF A CASE IN THE MUSEUM,

Showing King Henry VII.'s gallon (1), bushel (3), and (octagonal) yard (4); Queen Elizabeth's gallon (2), cwt. (5), 7 lb. (6), pint (7), and ell-bed with ell-rod (9); and Queen Anne's wine gallon (8), which is still the standard for the United States.

In 1758, as recorded in Lord Carysfort's report from the Weights and Measures Committee, new standards of the yard and of the avoirdupois weights were made, and ordered to be kept by the clerk of the House of Commons. From the report of Commissioners, presented to both Houses of Parliament in 1841, it appears that, in consequence of the burning of the legislative palace, new standards were required. The actual Imperial standards now in use were accordingly made under the direction of her Majesty's Treasury, and were legalised by the Standards Act of 1855. There are four carefully-preserved copies of these. One set, packed in a fire-proof, coffin-like box, is built into the side wall of the main staircase in Westminster Palace—the place being marked by an inscription in brass. Although there is no statutory requirement that this parliamentary standard of the pound-weight and yard-measure must be periodically

inspected, yet at least once in every twenty years an official inspection—when the Speaker of the House of Commons is present—is found to be practically necessary. The period for this official examination is now just past, and these long buried standards have once more been disinterred for the purpose of inspection. The model pound-weight is a little cylinder of platinum, wrapped up in the smoothest Swedish tissue-paper to prevent grazing, enclosed in a bronze box, and that again enclosed in a silver-gilt case.

BASEMENT OF THE JEWEL HOUSE, NOW USED AS A WEIGHING ROOM.

Besides containing the accurate weights and measures which have been authorised from time to time, the Standards Office also treasures, for the warning of the unscrupulous, a collection of false weights and measures, on account of which fraudulent traders have been punished by fine or imprisonment. Here we have evidence of varied shades and developments of roguery; light weights partially hollow, or lined with cork—some of them deficient to the extent of 30 per cent.; other weights unduly loaded, so as to favour the purchaser of metals; beer-mugs with false bottoms, etc.

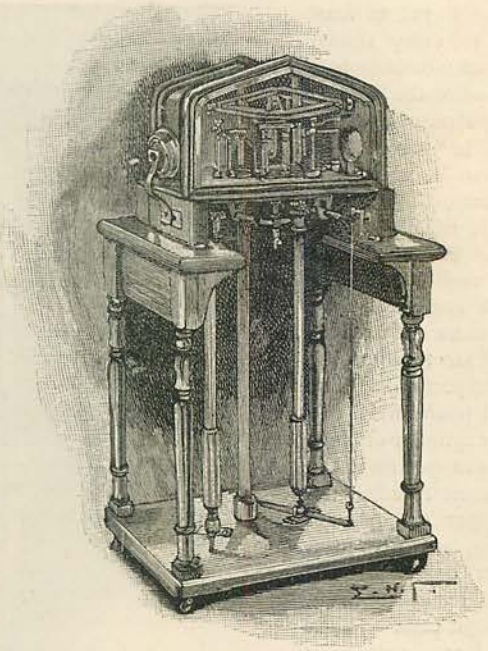
The minute accuracy insisted upon in the ultimate tests is well illustrated by the use of a complicated and delicate apparatus known as the "vacuum balance," which is said to be the only instrument of the kind in existence, and cost £250. The apparently idle question has sometimes been asked, Which is the heavier, a pound of cork or a pound of lead? One is naturally disposed to answer that, although very different in bulk, both must be of the same weight. Yet there is a difference, explained by the fact that the precise weight of a substance depends upon the weight of air it displaces. On account, therefore, of the larger vacuum it creates, the pound of cork is heavier *in vacuô* than the pound of lead. In order to keep clear of all such disturbing influences, and arrive at infallible accuracy, the Act of 1878 requires the standard pound weight to be tested *in vacuô*; hence the use of a vacuum balance from which all air has been excluded.

(1) Brass weight cut in two, showing interior hollowed out and filled with lead. (2) Brass pound weight, with hollow bottom soldered on. (3) Iron weight cast hollow, and plugged with cork. (4) Iron weight, apparently perfect, but actually enclosing a large piece of wood.

In a speech delivered not long ago, Lord Salisbury described the land as being covered with inspectors. There were recently no fewer than 1,500 appointed by local authorities to look after weights and measures. They have to undergo, under the supervision of the Standards Office, an examination as to their technical fitness, and the law also requires that the local standards provided for their guidance must be tested in the same department once every five years by comparison with the Government standards. Here we see all the appliances requisite for this and kindred purposes, such as the means of testing gas-meters, etc., the illuminating power of gas—which must give, in model burners, an intensity of light equal to

sixteen sperm candles—and also of testing the inflammability of petroleum in different degrees of temperature. Unerring exactness is, of course, required in the screw threads for watches, which are adjusted according to the standards of the British Association. Screws in use for engineering purposes are now generally adjusted in accordance with what are known as the Whitworth standards. All wire is measured by sizes which correspond with certain notches in the Birmingham wire gauge plate. At the Standards Office we find all these; likewise a duplicate of the Imperial standards of length—inch, yard, perch, pole, etc.—which are fixed into the boundary wall at the north side of Trafalgar Square, behind Nelson's Monument. A copy of the same is laid down at the Guildhall. So often are these two referred to by visitors from the country and others, that arrangements have been made for laying down authorised copies of these standards at easily-accessible points in the leading provincial towns.

In order to secure uniformity throughout the British Empire, the standards for not only every part of the United Kingdom, but also for India and the Colonies. are tested at Westminster. So high is the repute of this department in other countries that Russia, for instance, has more than once sent her standards to the same office for verification. This is considered no small tribute to the exceptional care and capacity of the superintendent of the department, Mr. Chaney, who is regarded as probably the best living authority on the whole subject of weights and measures. His courteous guidance through rather labyrinthine premises leads the visitor, by a subterranean passage, under a corner of Dean's Yard to the ancient Jewel House. This is said to be the only part of the Abbey saved from the fire by which the original edifice was destroyed. During three centuries it was used for keeping the regalia at coronation times, and as a place of deposit for peers' records. Before passing into the hands of the civil authority, this quaint strong room was the refectory of the Abbey monks.

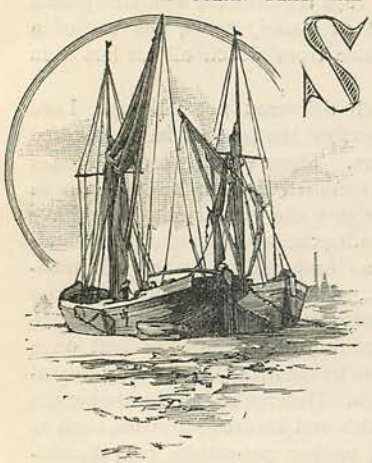


THE VACUUM BALANCE.

FORMED FOR CONQUEST.

CHAPTER THE FIRST.

"AS OCEAN BEAT THE STONE."



SHE looked down on the sea, two hundred feet below.

The cliff rose sheer from the blue-grey stones of the beach. The railing that had been put up for protection round the edge of the bare rock was old, and in places broken; but Damaris Lemarcham leant against it with the security of custom, and looked down with a steady eye at the waves breaking on the beach.

The breakers fell in long, broken lines of white on the pebbly beach; a dull, hollow murmur filled the summer air: a sound produced from the rounded blue-grey stones washing against one another. It was always to be heard at Trentham Cove—in calm weather, a soft murmur; in stormy weather, a dull roar, which reached as far as the town of Hallsburn, fifteen miles inland.

It was a soothing murmur to-day. The weather had been fine for weeks, and the sea was as smooth and calm as it ever became at Trentham.

Scarcely a day had passed of Damaris Lemarcham's life without her standing on this spot and looking at the familiar scene.

It satisfied her.

Two miles on her right, below her, the village of Trentham—a few fishermen's cottages—clustered at the foot of the cliffs. Beyond the village the shores of the bay were covered with trees and bushes to the water's edge. A break in the greens and browns of the foliage showed the Indian red of West Country