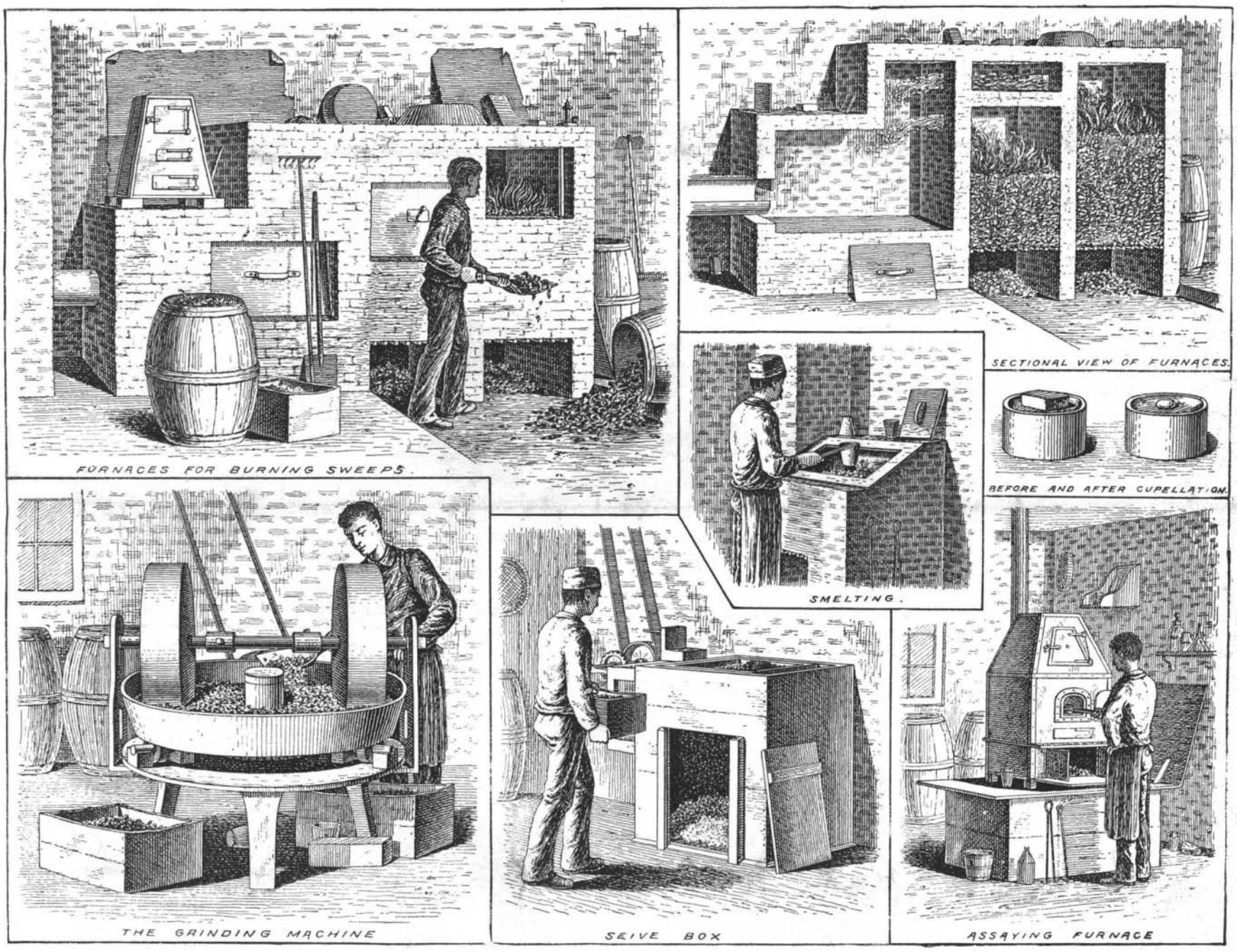
GOLD AND SILVER REFINING FROM JEWELERS' SWEEPINGS.

The illustrations of this subject were taken from the plant of J. Tunbridge & Son, Newark, N. J. The sweepings from manufacturing jewelry establishments, consisting of paper, dust, old crucibles, etc., are packed in barrels and carted to a refinery, where the material is first put into furnaces and burned. These furnaces are about 3 feet square and hold 3 to 4 barrels. The fire is started with wood and continues to burn until the whole material becomes caked and brittle. Each furnace is provided with a flue which opens into a dust collector, and gold and silver dust carried through these flues by the draught drops down to the bottom of the collector. After each burning the caked material is taken out and broken up into small particles and placed with the dust from the collector in a grinding machine. The revolving pan in which the material is ground is 3 feet in diameter, ¾ of an inch thick and about 8 inches in depth. The two cast iron wheels which crush the material revolve loosely on the shaft running across the center of the pan; these wheels are 2 feet in diameter, 6 inches in width and weigh 700 pounds each. Running through the center of the pan is a vertical shaft which passes through a large gear wheel connected to the bottom of the pan. This wheel connects with the main shafting, and when it is set in motion the pan revolves, causing the large wheels to revolve and crush the material. After grinding to a powder it is run through a 40 mesh sieve, the material not passing through being put back into the grinding machine. The fine powder, with a little lead and flux added, is then put into a crucible and smelted. On breaking the crucible after cooling, the lead button taken out contains the gold and silver. The button is put into a bone-ash cupel and placed in a muffle or assaying furnace. The cupels are from 1½ inches to 2 inches in diameter and from ¾ to 1 inch in height. The muffle in which the cupel is placed is made of fire clay and is about 14 inches in length, 7 inches in width and about 6 inches in height and oval shaped on top. The muffle is completely surrounded by fire when in the furnace, and when the fire becomes of a whitish red heat, the lead melts and is sucked up by the porous bone-ash cupel, leaving the gold and silver button. The gold and silver are afterward separated by what is called parting, which consists in boiling the alloy after rolling it out to a thin plate in strong nitric acid. The value of these sweepings varies greatly, averaging about $5 per barrel, although it has been known to run up as high as $500 per barrel.



GOLD AND SILVER REFINING FROM JEWELERS' SWEEPINGS.

Copper on Birds' Feathers.

At a recent lecture at the Royal Institution, London, Professor A. H. Church, after some preliminary remarks upon the obscurity which still shrouds so many natural coloring matters, and upon the difficulty experienced in isolating them, proceeded to give an account of turacin, its sources, mode of occurrence, properties, and derivatives.

Turacin appears to be peculiar to the plantain eaters, or Touracos, an African family of birds, which contains twenty-five species. Of these, eighteen species, namely, all those belonging to the three genera, Turacus, Gallirex, and Musophaga, contain this pigment in from eight to eighteen of the primary and secondary feathers of each wing. It occurs also in the head feathers and crests of some of these birds. It may be extracted by the most dilute alkaline liquids, producing a magnificent crimson solution. It has a perfectly well defined absorption spectrum. When a single red feather is burnt, the green flash of copper is distinctly seen; indeed, the pigments when extracted by ammonia, precipitated by an acid, and then dried, contain seven per cent of copper. One other animal pigment containing this metal is known; this is hæmocyanin, a respiratory pigment like the hæmoglobin of blood, not a mere decorative pigment like turacin. It contains, however, a very small proportion of copper.

Mention was made of turacoverdin, a green pigment occurring in the feathers of some Touracos, and apparently formed also by the exposure to air and moisture of turacin, or by boiling that substance with caustic soda. When turacin is suddenly and strongly heated, it gives off a crimson vapor which condenses into a crystallic substance containing both copper and nitrogen and yet quite distinct in its properties from turacin. Sulphuric acid dissolves turacin, turning it into a new pigment, turaco-porphyrin, which presents striking analogies with the hæmato-porphyrin similarly derived from hæmatin.

The amount of copper in the turacin of a single bird is rather less than one-fifth of a grain. As this metal is certainly present in bananas, the chief food of many species of Touraco, and is generally distributed, though in traces only, in the vegetable kingdom, there does not seem to be any real difficulty in accounting for its source. This pigment, turacin, presents some features of unique interest. It is extraordinary to find it occurring in a single family of birds, and in three genera of that family only, and not—so far as has been yet ascertained—in any other allied forms, such as the cuckoos, the woodpeckers, and the hoopoes, which all belong to the same natural order.

The percentage composition of turacin is carbon 53·69, hydrogen 4·60, copper 7·01, nitrogen 6·96, and oxygen 27·74.

Complicated Relationship the Cause of Suicide.

One of our medical exchanges relates the following as a fact:

William Harman, a resident of Titusville, Pa., committed suicide a few days ago from a melancholy conviction that he was his own grandfather. Here is a singular letter that he left: "I married a widow who had a grown-up daughter. My father visited our house very often, fell in love with my stepdaughter, and married her. So my father became my son-in-law and my stepdaughter my mother, because she was my father's wife. Sometime afterward my wife had a son; he was my father's brother-in-law and my uncle, for he was the brother of my stepmother. My father's wife—*i. e.*, my stepdaughter—had also a son; he was, of course, my brother, and in the meantime my grandchild, for he was the son of my daughter. My wife was my grandmother, because she was my mother's mother. I was my wife's husband and grandchild at the same time. And as the husband of a person's grandmother is his grandfather, I was my own grandfather."

That is So.

Inventors, like most other men, are willing to make money out of their inventions, but many of them go about their work in just the wrong way. Instead of devoting their time to the invention of machines or processes, or parts that are sure to be valuable to large numbers of manufacturers or laborers, they stick to the idea that fame and fortune come only to the inventor who makes a revolution. If such men will only look over history carefully they will find that the great fortunes and fame made of "revolutionizing" inventions are few and far between, while the greater number of successful inventors have made their fortunes out of things that are small, simple, and capable of general use. The small things that perfect existing large things are what should receive most attention.—*The Iron Industry Gazette.*

Resistance to Cold.

The death of a centenarian Italian in a Norfolk town the other day, whose checkered life-history included service in Napoleon's "Grande Armée" during the disastrous Russian campaign of 1812, recalls attention to the fact that of all that host the Neapolitan contingent, 10,000 strong, withstood the cold and privation much better than the other divisions, recruited as these mainly were from Northwestern and Central Europe. So interesting and unexpected was this phenomenon, put on record by Baron Larrey, head of Napoleon's army medical staff, that the physiologists and hygienists of the time hazarded many explanations of it—explanations revived and checked during the Crimean campaign forty years ago, when again the Italian regiments of the allied forces were found to suffer less from the Russian winter than their French or even British comrades.

The view taken of the fact was this: That the Italians, born and reared in the sunny South, retained so much "caloric" in their systems that their supply of it continued long after their fellow soldiers from less favored climes had used up theirs. In support of this the experience of other Italians was invoked who, as teachers or artists, had settled in English or Scottish educational centers, and whose power of weathering the first northern winter was much greater than during the second and third, by which time, it was contended, their supply of "caloric" was exhausted and they were fain to have recourse to the creature comforts for which at first they had a positive repugnance. Australian colonists and Anglo-Indian officers, on their return to the mother country, cited their experience in a similar sense, and Claude Bernard's "Chaleur Animale" (1876) came afterward to translate those popular inductions into scientific language. No doubt during those Russian campaigns the Italian troops, new to such a climate and to such winters, felt the keenly oxygenated air as a stimulating restorative influence rather than as a depressing one, and all through the several weeks of their subjection to the novel conditions the "systemic response" to these declared itself in a heat production considerably in excess of the heat loss. The question, of course, arises, Could that "systemic response" continue at its maximum of force the second winter? Experience answered in the negative, and the testimony of Italian civilians resident in the British Isles, as well as of the Australians and Anglo-Indians aforesaid, points to the same conclusion. One element in the explanation of the phenomenon, however, must not be overlooked, and that is the greater temperance of the southern as compared with the northern European. To the former—and this was especially marked in the disastrous retreat from Moscow—the abuse, or even the sparing use, of alcohol was all but unknown. This abstinence put the Italian at a mighty advantage over the northern soldiery, who, as Sir Walter Scott has placed on vivid record, flew to cognac or vodki whenever they could get at it, and considered themselves happy if they could purchase "some hours of insensibility" by intoxicating liquors.

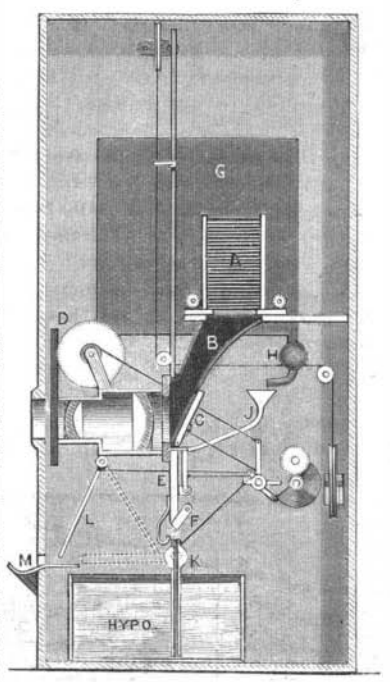
Then, again, Italians in general, and Neapolitans in particular, inured to the scantiest meals of macaroni and salad, felt the starvation diet of the forced marches much less than their French or Teutonic comrades. The same must also be said in the matter of clothing—the Neapolitans, even in abnormally cold winters, contenting themselves with an artificial warmth in raiment and fuel much below that to which the northern races are accustomed.—*Lancet.*

Breaking Up Their Old Ships.

The opinion, says the *Ironmonger*, is gaining ground in the North of England that, with one million tons of shipping lying idle, much of which will never be used again because it is obsolete and cannot be worked successfully against the economical modern type of steamer, it is the duty of owners to break it up and put the old metal in the market. Much of this sort of work has already been done on the Clyde, the Mersey, at Belfast, and at Barrow, and it is probable that during 1893 a further number of old ships will share this fate. Many of the agents who have ships on sale strongly recommend this course. It has the merit of common sense in it, as, if the ships cannot in future find remunerative employment, they may as well be converted into money as soon as possible, and clear away a vast tonnage which is standing in the way of further legitimate developments in sailing ships and steamships of modern type.

AUTOMATIC PHOTOGRAPHY.

Of all the many uses to which the automatic selling machine has been put, that of taking photographs seems the most remarkable. And yet this is what is being done now in several public places in New York and Brooklyn by means of a nickel-in-the-slot photograph machine recently patented by Mr. Pierre V. W. Welsh, of New York City. The operation, so far as relates to the exposure, development and fixing of the picture, is entirely automatic, and the little picture which the machine throws out, after a momentary washing, appears to be a marked success over previous efforts in this direction, as judged by the excellence of the work and the rapidity with which it is effected. The manufacture of these machines is now being carried on in a practical way by Mr. William F. Freeman, of No. 85 Beaver Street, New York City. The mechanism of the apparatus, as shown in the illustration, is inclosed in a case suspended by a cord in an open frame, a weight on the other end of the cord forming a counterbalance, so that the case may be readily moved up and down by the attendant to bring the exposure opening to the proper height for the picture to be taken. Below the exposure opening, in the front of the case, is a delivery tray on which the finished pictures are thrown out, and at one of the upper corners is a slot for the reception of the coin, the attendant in this instance furnishing, for an additional nickel, a stamped metal case for the finished picture.



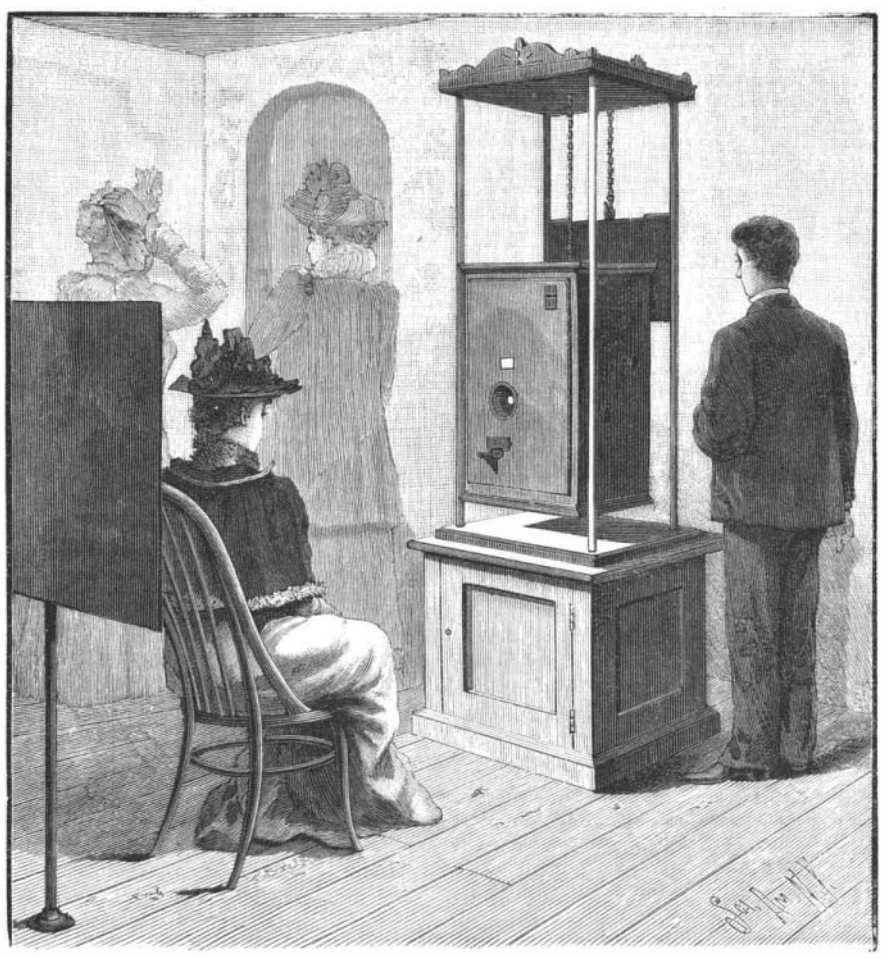
PHOTOGRAPH MACHINE.—Fig. 2.

The coin placed in the slot is carried by a chute to a plate connected with a tilting lever adapted to set in motion a clockwork mechanism, which drives a main shaft extending horizontally through the back part of the machine, this shaft carrying cams which effect the various operations of the several parts of the machine. The lens tube is of the ordinary style, and at its front end slides vertically the shutter, D, as shown in the detail view, Fig. 2. A rack on the shutter engages a gear wheel connected with a cable extending backward and downward to a connection with the main driving shaft, a cam on which causes the cord to be pulled to raise the shutter as the process commences with the dropping in of the coin, the shutter dropping back to place of its own weight after the exposure. At the inner end of the lens tube is a swinging fly, C, adapted to swing up in vertical position, the fly swinging in the lower end of a chute, B, through which drop the plates from the holder, A. Both the fly and the plate-delivering devices are operated from the cam shaft, the plates being of the usual kind employed in taking tintypes, and each revolution of the shaft deposits a plate in the chute. Immediately below the fly is the developing bath tank, E, into which the plate is mechanically dropped after exposure, the tank being cut off diagonally at its lower end by a valve, F. The developing liquid is carried in a tank, G, in the upper portion of the machine, a tube leading therefrom to a bulb, H, which holds a charge for the bath tank, the liquid flowing through the funnel and tube, J. The bulb is charged and its contents delivered to the bath tank with each revolution of the driving shaft, the exhaust liquid being in each case conducted to a waste tank. When the plate drops from the bath tank after being developed, it passes into a grooved receiver, K, which extends down into a fixing bath of hyposulphite of soda, the receiver with its plate being afterward raised to horizontal position, as shown in dotted lines, when a pusher arm throws the plate, now a finished picture, forward upon the delivery tray, M.

SPECIMENS OF THE PHOTOGRAPHS.

The time required to take a picture is 45 seconds, and the time of exposure is six or seven seconds, the lifting of the shutter and its dropping being plainly perceptible to the sitter. In this short period the plate is taken from the plate holder and held in position before the lens tube, then dropped into a developing tank, where the picture is brought out by the application of the developer, from thence being passed to a fixing bath and finally pushed out upon a receiving tray, where an attendant gives it a momentary washing. The accompanying half-tone pictures are photographic reproductions of photographs made on the machine.

The construction of the machine is such that all the movements are simple, easy and positive, and there is little liability of the parts getting out of order. The plate magazine will hold 240 plates, and when emptied it may be refilled in three minutes.



WELSH'S NICKEL-IN-THE-SLOT PHOTOGRAPH MACHINE.

IMPORTANT DECISION IN ENGLAND.—Ex-Congressman John S. Wise and O. T. Crosby went to London some weeks ago as experts in the suit of the National Telephone Company of Great Britain *vs.* the Leeds Tramway Company. The question at issue was whether the tramway company, whose wires worked injury to the wires of the telephone company, should not be restrained.

Electricity says: The English counsel had collected a mass of evidence showing that the tramway wires did not seriously injure those of the telephone company. Mr. Wise advised that all this testimony was irrelevant, and that the proper position to take was to admit the serious injury, but to claim equal rights to the earth with the telephone company. His advice was taken, and the court, Mr. Justice Kekewick, sustained Mr. Wise's contention.

Charles H. Haswell.

The editor of the *Engineer*, speaking of him, says with truthfulness there is no more striking figure in any profession to-day than that of Charles H. Haswell, who at the age of 84 + is still actively at work daily. Notwithstanding his years he is as erect as an athlete and apparently as tireless, he goes about, up and down long flights of stairs to offices where there are no elevators, transacts even trivial matters, and has, apparently, discovered the fountain Ponce de 'Leon sought for unavailingly. We think it would be hard to find anywhere in the world another professional man who is doing the work that Mr. Haswell does constantly, both physical and mental. We should be proud of the career of this veteran American engineer and honor him while he is still in the flesh.