THOUGHTS ON THE PROGRESS OF SCIENCE.

MESSRS. EDITORS:—Since I had the pleasure of receiving the back numbers of your interesting and instructive journal, I have shown specimens to several influential manufacturers and intelligent mechanics in this vicinity. One man told me that he had twice obtained $5 for a single recipe that he copied out of the SCIENTIFIC AMERICAN, which he has taken regularly for several years; and I presume this is not an isolated case, by many hundreds. It is just such journals as yours that are annually condensed into encyclopedias, the compilers of which roughly scoop off the cream of all the new discoveries in science and art that have been recorded in the columns of various periodicals during the year; but the facts set forth in such annual works are often so mutilated or distorted in the condensation and so meager in outline as to be practically of no value. Every mechanic and farmer in the land should subscribe for the SCIENTIFIC AMERICAN, not only for his own benefit, but also that of his children; he may have a Franklin or a Fulton, a West or a Watt, in that little marble-player whom he pets in his leisure hours; and the natural bias of the child's mind toward mechanical or agricultural pursuits requires to be confirmed and further developed by intellectual nourishment of such a quality and quantity as can be derived only from a journal like your own.

Many a gigantic mind has derived its first electric stimulus from a brief hint in some periodical devoted to the dissemination of mechanical or agricultural knowledge. Some of the greatest discoveries have originated in the simplest and most common occurrences. Newton's theory of gravitation and Galvani's discovery of the science which bears his name are shining examples. Sails are said to have been suggested by the structure of the shellfish *nautilus;* paddle-wheels, by the webbed feet of aquatic fowls; screw-propellers, by the tails of certain fishes, &c. Steamboats, locomotives, balloons, telegraphs, printing-presses, fire-arms, reapers, sewing-machines and daguerreotypes have been wonderfully improved in the last fifty years; some of these had no existence anterior to the dawn of the present century. Although the sad experience of such men as Fitch, Cort and Hunt prove that original inventors of great discoveries sometimes derive little pecuniary benefit from their labors; yet the fruit of their genius almost always confers both gold and glory upon their children, and history immortalizes them as having been benefactors to the human race, and awards them, in the estimation of posterity, far greater honor than is ever given to kings or emperors.

The knowledge of effects (or *facts*) and their causes, together with the manner in which they mutually effect each other, is what constitutes all science; art is the practical application of the principles deduced from that knowledge to the useful purposes of life. Independent of the practical utility of the study of natural philosophy to the world at large, in ministering to our comforts and luxuries, it is the sumptuous "feast of reason" for the nourishment of the master-minds who are ever seeking to penetrate the arcana of Nature. Such men as Sir David Brewster do not need to be millionaries; they are, indirectly, the directors of the wealth of the world.

I am glad to see the names of many southern inventors frequently published (in your journal) as successful patentees; because the tendency of the southern mind has hitherto inclined more to physical than mental development. Commerce, ship-building, navigation, wheat and grass culture, cattle-raising, and large manufacturing depots, will ever give the pecuniary ascendancy to that section of country in which they flourish.

Let me encourage you, gentlemen, in your great enterprize. Perhaps, we need light and elegant literature; we may even need "chess columns;" but let the SCIENTIFIC AMERICAN continue to teach the people how to realize Dean Swift's prayer—"make *two* blades of grass grow on the spot where only *one* grew before;" let it still increase the mechanical and agricultural knowledge of our artizans and farmers, by publishing the latest discoveries in science and improvements in the arts; and then its editors will have the noblest reward—that of being considered the "guardian angels" of genius, the champions of inventors, and the "prime motors" employed in developing the highest physical and intellectual resources of this great country.

W. A. SHAW, M.D.

Camden, Ark., Sept. 30, 1859.

THE ATLANTIC TELEGRAPH.

MESSRS. EDITORS:—Having examined with some care a piece of the old Atlantic telegraph cable, I have detected three scientific errors in its construction, either of which was sufficient to defeat the practical telegraphing through its entire length when laid in the ocean.

The first error was the surrounding of the insulating material with such a quantity of iron wire for strength and protection, when like resnlts could have been secured with material of a non-conducting character. If the cable had only been 1.50, the specific gravity of the water, it would have sunk slowly into its ocean bed without the great strain on it which was experienced, owing to its excessive weight.

The second error was the using of gutta-percha as an insulator, also pitch and resin, in part of the coating. Each of these substances is more or less porous, and absorbs water under favorable circumstances, especially great pressure of water for a continued length of time. India-rubber is not such an absorbent of water as gutta-percha, nor is it so liable to chemical changes; it is, therefore, a superior insulating agent.

The third error, and by far the most important, was the faulty mechanical arrangement of the copper conducting wires. These consisted of seven small strands twisted into a cord from right to left, making one convolution in every one and a half inches of the whole length of cable. One of these wires formed a core to the other six which were twisted around it, and of course it was straight. The six twisted wires, therefore, were five-eighths of an inch greater in length to the yard than the interior one, and this amounted to fifteen miles in the thousand, and forty-five in the entire length of the cable. Here, then, was a cable constructed with its interior conducting strand forty-five miles shorter than any of the other six conductors. As the electric current in a conductor always passes on the shortest circuit and moves through equal distances in equal spaces of time, it followed as a necessary consequence that the current on the short interior strand of the cable traveled forward—to use a plain term—in advance of that of the other six wires. Therefore, when the current from the one wire reached its terminus, the usual counter-induced current was produced in advance of the positive current in the six spiral wires, thus tending to neutralize their action. This may account for the uncertainty and peculiar unreliable vibrations of the galvaniscope which were witnessed when the cable was first laid. A very powerful negative current was no doubt also produced in the center wire by the direct positive current in the other wires when the two met, thus causing galvanic reaction in the entire circuit.

In forming another cable great care should be exercised to have one large and strong conductor only, or if several are employed, they should be laid parallel so as to have them of an equal length throughout the whole extent of the cable. Or if several strands of wire are chosen and the spiral form desired for strength and flexibility, three large No. 12 or 14 wires, or the multiplicands of this number of small wires of the size in the cable, would doubtless answer. These can be twisted without a core and all be of equal length, so as to pass the current with a unity of speed, and thus prevent reaction in sending messages from shore to shore across the great Atlantic.

J. H. T.

New York, Oct. 5, 1858.

WATT'S STEAM-ENGINE IMPROVEMENTS.

In answer to the inquiry of a correspondent respecting the principal contributions made by James Watt to the steam-engine, we present the following summary, which for convenience of reference will be useful to all our readers:—

1. The condensation of the steam in a vessel distinct from the cylinder, which was thereby always kept hot.
2. Removal of t he air and water from the condenser by an air-pump.
3. Producing the movement by the force of steam instead of by the air's pressure.
4. Cutting off the steam before the completion of the stroke, thus saving steam and equalizing the motion of the piston (expansively-acting engine).
5. Giving the piston an impulse or moving power in ascending as well as descending (double-acting engine), and invention of the parallel motion.
6. Converting the alternate rectilineal (reciprocating) motion of the piston into a continuous circular motion by the sun-and-planet wheel or crank, so as to adapt the engine for impelling machinery.
7. Application of the governor and throttle-valve, &c., to render the motion smooth and uniform.

A COLUMN OF INTERESTING VARIETIES.

At Fort Monroe, Va., a party of United States soldiers are employed in a very novel manner. They are trying to wear out an old gun which weighs no less than 15,000 pounds. 10 pounds of powder and a ball weighing 123 pounds constitute the charge, and with this tremendous load it has been fired over a thousand times. Near it are two guns which were discharged 2,000 times at Pittsburgh. The object of the firing is to test the durability of the iron; and, as to satisfactorily ascertain this, the gun must be worn out, the soldiers are destined to hear thunder for some time.....The year 1609 is for ever memorable from Galileo's discovery of the telescope. Being at Venice his house was thronged with visitors to satisfy themselves of the truth of the wonderful stories told of his instrument.....Boswell observing to Dr. Johnson that there was no instance of a beggar dying for want in Scotland, "I believe, sir, you are very right," says Johnson, "but this does not arise from want of beggars, but the impossibility of starving a Scotchman."....A few years ago, a small island was thrown up by volcanic action in the Mediterranean, in sight of a man-of-war. The captain took possession of it, but scarcely had he planted the British flag on this territory, so strangely upheaved from the waters, when the whole fabric disappeared, and left not a fragment behind.....One of the anthracite hot-blast furnaces of the Lehigh Iron Crane Company, at Catasauqua, Pa., made 6,207 tuns of pig iron in the 26 weeks ending June 30, or nearly 239 tuns per week. The London *Engineer* says this is unprecedented.....Gutta-percha is vulcanized with sulphur in the same way as india-rubber .....In the Berlin Arsenal are two leather guns used by Gustavus the Great, in the 30 years' war.....On the St. Germain Railroad, in France, the pay of first-class engine-drivers is $65 per month.....In the museum at Dresden is a tube, many feet long, formed by lightning falling upon a bed of sand, which has been partially melted by the electric fluid.....A tunnel of 24 miles' length is in progress from Freiburg to the Elbe, at Meissen, for the purpose of draining the mines around the first-named place.....In the historical collection at the Palace of Berlin there are two cannon-balls, each with one side flattened, said to have been fired by opposite parties at the siege of Magdeburg, and to have met together in the air.....There are few operations going on at the earth's surface which are not more or less influenced by atmospheric pressure. The pressure of the atmosphere was discovered in 1643, by Torricelli, who also invented the barometer, the discovery being confirmed by an elegant experiment devised by Pascal. The air pump was invented by Otto Guericke, a magistrate of Magdeburg, about the year 1650. In the vacuum of an air pump, liquids boil at about 140° Fah., lower than when exposed to the ordinary atmospheric pressure.....Three of the masts of the *Great Eastern* are made of hollow iron in eight-feet lengths, strengthened with diaphragms. Between the joints, as they were bolted together, were placed pads of vulcanized india-rubber, to render the masts elastic. The four engines which drive the paddle-wheels of this steamer are oscillators, of 14-feet stroke. .....By Lord Rosse's telescope objects 100 feet high on the moon can be distinctly seen.....A cubic foot of distilled water weighs 997.136 oz., or, in round numbers, 1,000 oz.....Dr. Ernst Alban at one time worked a steam-engine in London, to a pressure of 1,000 pounds to the inch.....In the lace manufacture, one man with the machine does the work of 8,000 workers on the cushion.....The engines of the packet-steamers running between Southampton and Havre have each three cylinders, open at the top, the steam acting on one side only of each piston.....Steel swells in hardening. Iron absorbs carbon and swells in case-hardening, as well as in conversion into steel. Forgings of scrap iron are liable in case-hardening, to absorb unequally, and to twist or warp, owing to the irregularities of the iron.....The weight of ice is 94 per cent of an equal bulk of water .....An instance is on record of 1,000 bricks being well and permanently laid in one hour by a single workman. This was done for a wager, nearly 50 years ago, in the front of the old City of London tavern, now the site of the Wesleyan Centenary Hall.....The great acqueduct at Roquefavour, in France, is 270 feet high, and 1,320 feet long. It is formed of three rows of arches.....Integrity, however rough, is better than dissimulation.