in the cab, was very seriously injured. His face and shoulders were terribly burned, and his eyes were so injured that it is thought he will be blind for life.

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RE-DISCOVERIES AND RE-INVENTIONS.

The investigator who thinks he has hit upon some new and important fact, but finds, on publishing his discovery to the world, that he has merely re-discovered an old and long-known phenomenon, is very much in the position of an inventor who has spent months in perfecting some machine which he believes to be new, but which, as the Patent Office examiners tell him, was patented years ago: perhaps it was used and abandoned before he was born. The airy castles each has been building are dashed to the earth, and dire disappointment destroys the searcher's peace of mind. Under these trying circumstances, it is difficult for him to sit patiently down and feel that the experience gained while prosecuting his work is a sufficient reward for his time and toil. Yet such is frequently the case; and but for the fact that most inventors and investigators are dependent on their daily labor for the bread they eat, they could in all cases feel that an honest, conscientious labor in the pursuit of a noble end, whether successful or not, is its own sufficient reward. Failure is to some minds a spur to greater exertion; it incites them to increased care, and thus proves more beneficial than success would have done. That man (or crew) that comes out of a race second best is generally confident of his ability to win next time; and he goes into training with eagerness for another chance to test his power. To another class of minds, failure is very discouraging. They have not perseverance enough to try again; or if they stand the shock of a few failures, they break down at last under the weight of continued ill luck, as they call it. That "nothing is so successful as success" is not more true than that nothing is more disheartening than failure. But since failure and disappointment fall, in a greater or less degree, to the lot of every man in every undertaking, we would first offer such balm as we may to heal the bruises, and then prescribe some preventives that will reduce the number of failures, especially those of re-invention and re-discovery, to the minimum number.

We have already hinted at the manner in which we would have the unsuccessful investigator regard his labors. The searcher for truth can no more measure the value of his labors by their results, than can the competitors in our intercollegiate contests, whether literary or athletic, measure the benefit they derive from the training by the value of the prizes conferred. A school boy of ten or fifteen diligently pursues the study of some subject, for which a beautiful prize is offered, with that prize and its inherent honor as his sole object and incentive. The prize was offered for the purpose of teaching the boy perseverance, of imparting to him the habit of study, and, in some cases, of putting him in possession of the knowledge thus acquired. The competitor who has labored industriously for the prize, but failed to obtain it, is benefited quite as much by the training he has received as the one who is successful, provided only that disappointment does not breed discouragement. While boys may strive for prizes with no higher end in view, it is beneath a man, and more especially an investigator, to work with that aim only. Work undertaken in the proper spirit is never without benefit to him that does it; and although it does not yield the expected fruit, it has been all the while conferring other benefits, more lasting, if less pleasing. There is a story, no doubt familiar to most of our readers, about an old man, who, when on his death bed, told his sons that treasure had been buried somewhere on his farm. Eager for gold, they explored every field, digging over every foot of it to a considerable depth. Of course, they found no gold; but the increased fertility of the land amply repaid their labor. Parallel cases are abundant, wherein the object sought was never found, but where incidental results proved of immense importance. The old alchemists worked with but two aims before them, to transmute the base metals into gold, and to find the elixir of life. They succeeded in neither, but they gave us many substances more valuable than either. Many of the acids and metals, as well as phosphorus, were prepared or discovered by them, and their experiences have been woven together to form the foundation of the science now called chemistry. Unfortunately, however, their selfish jealousy induced them to conceal rather than promulgate their discoveries, and many of their most important secrets were buried with them. It is only recently that men have begun to observe and carefully record the little incidental discoveries. These little facts, trifling and disconnected as they are, may some day find a place of importance in the science, or they may become the seed which, falling on the fertile soil of some other active brain, will there spring up in a new and unexpected form.

Reader, if you are an experimenter, carefully record all your experiences, and publish such as are new, for you know not which of these tiny sparks will start a huge conflagration, or which trifle will be to some active mind what the falling apple was to Newton, or the oscillating chandelier to Galileo.

To give such directions as would aid the investigator to save his time and energies, on subjects already thoroughly examined, and in repeating well known experiments, is not difficult. Scientific men of the present century have been careful to record in permanent form most of their investigations, and hence it becomes possible for a person, before beginning a research, to ascertain just what has already been done, provided he has access to a good scientific library, such as the Astor or the Columbia College School of Mines Libraries in this city, both of which are free to all and possess excellent catalogues and obliging librarians. The method of study will be somewhat as follows: Suppose a chemical student is about to attempt the preparation of some new compounds of cobalt. He may first, if he chooses, make use of the excellent dictionaries of chemistry published in each of the principal languages, for our student ought to read French and German with some fluency. The best works to consult are Watts,' Wurtz, and Fehling, but every accessible work should receive attention. Having obtained a general idea of the subject in hand, he next proceeds to search the scientific journals one by one, from volume I to the latest number. Among the most important of these we would mention the *American Journal of Science and Arts*, 1818 to date, 110 volumes. The task of examining these numerous volumes is not so very great, since every tenth volume contains an index to everything in that and the preceding nine, so that only 11 indices have to be consulted. Poggendorff's *Annalen* now embraces over 230 volumes. from 1799 to date, but the titles of all the articles are registered in half a dozen indices. Dingler's *Polytechnisches Journal*, now in its 218th volume, has 3 indices. The *Annales de Chimie et de Physique*, which now number 275 volumes, beginning as far back as 1789, have several index volumes. The same holds true of most of the scientific journals where original papers are to be looked for. *Comptes Rendus* is an unfortunate exception to this rule.

Before beginning this search, a suitable note book should be procured, and so arranged that every reference can be quickly recorded as soon as found, either chronologically or in some other systematic order. Or the references may be taken down in a blotter, and subsequently posted in the order desired, care being taken to give date, subject, name of author, and name of journal, with page and volume. Such an index of a subject, carefully carried out, will be found invaluable. The student now has a guide book which will direct him at once to the spot where just such information as he seeks is given. From these, it is easy to ascertain just what has been accomplished, and hence it is almost impossible to repeat unwittingly what another has already done.

The inventor may not find it quite so easy to learn what has been attempted in his line, as inventors usually jealously guard their ideas as invaluable secrets. The patent records of different countries, however, afford material for quite an extensive search, and, as in the case of the chemist, will be of great assistance in preventing a waste of time in re-inventing old things.

Let no one say that it takes too much time to make all these preliminary examinations, for it will prove a saving in the end, not only of time and labor, but of good nature and enthusiasm. If those who can afford the time would join in preparing reliable indices of the whole literature of different subjects, and permit them to be published by the Smithsonian Institute or other scientific body, they would be valuable contributions to Science, and great aids to their fellow laborers of today and of the future; and they would serve to perpetuate the compilers' own memories.

FELTING AND ITS USES.

The employment of felt for other purposes than hats, which use was described in a recent number, has created several other branches of industry. The most common products are felts in flat layers like cloth, and the most usual mode of manufacture is a kind of wadding (by means of a machine similar to that used for the same purpose in cotton mills) and to submit this to the felting process, often felting several layers together so as to obtain great thickness. With improved modern machinery, such wadding may be made of considerable dimensions. A special and peculiar article of this kind, and of great comparative value, is the felt used for the covering of the hammers of pianofortes. The best material for this purpose is derived from the wool of sheep found only in Hungary. They are called the Esterhazy flock; and the wool gives a more elastic felt, resisting better the cutting effect of the strings, which soon wear other kinds of felt away. These felts come in the trade in elongated pieces, very thick at one end and quite thin at the other, so as to suit the requirements, which are that the hammers striking the bass strings should be covered with thick felt, the substance being gradually diminished for the higher tones, so that the hammers striking the strings producing high tones have a very thin covering. The pianoforte makers have then only to cut those felts into strips to have all the needed assorted degrees of thickness, it being a first requisite of the pianoforte, and in fact of every other musical instrument, to attain equality of tone, avoiding sudden changes in power when passing from one tone to another of the scale.

Other felts are manufactured into carpets, and printed with figures, forming the so called rugs, and others, well known, are blankets and materials for cloaks, women's skirts, socks, slippers, insoles for boots and shoes, etc. Some kinds of fine felts are saturated with varnish or paint, and changed into a material not unlike patent leather; this is used for the shades of caps, by carriage makers, etc., being much more tenacious and elastic than pasteboard, in which the fibers are not interlaced, and only are held together by a simple adhesion originated by great pressure during the process of manufacture. We must also mention the use of felt for roofing, for which purpose it is saturated with asphaltum, coal tar, pitch, or other equivalent waterproof material; and felt is also used in shipbuilding, as a layer below the copper sheeting, and on steam cylinders, conduits, and boilers as a non-conductor of heat, for which purpose it is often prepared with various ingredients, intended either to make it less combustible or to increase its capacity for retaining heat. A modern industry of this kind sprang up during the late war. Contractors, in order to increase their gains, had blankets and even soldiers' clothes made from felts of which the hair was not of the proper kind, but consisted of the offal of woolen factories, fibers too short to be spun, but which, by felting, could be made to hang together and form an apparently woven fabric; which, however, soon showed its tru

nature by its lack of strength. This material has obtained the name of shoddy; and while felt made from the proper kind of hair, of sufficient length, is as strong as any good woven fabric, this shoddy, or felt made from unsuitable kinds of hair and hairs of insufficient length, is comparatively worthless. Unfortunately thousands of dollars have been made in this disgraceful way before the nature of the deceit became known.

NO REST.

Science teaches us that the crust of our earth is perpetually moving, and that the sea level is constantly changing. Our globe has its daily rotation on its axis and its yearly revolution about the sun. The sun, with all its satellites, sweeps on toward a moving point in the constellation Hercules. Every so-called fixed star is in motion. Fifty thousand years ago the constellation of the Great Bear or Dipper was a starry cross; a hundred thousand years hence the imaginary Dipper will be upside down, and the stars which form the bowl and handle will have changed places. The misty nebulæ are moving, and besides are whirling around in great spirals, some one way, some another. Every molecule of matter in the whole Universe is swinging to and fro; every particle of ether which fills space is in jelly-like vibration. Light is one kind of motion, heat another, electricity another, magnetism another, sound another. Every human sense is the result of motion; every perception, every thought is but motion of the molecules of the brain translated by that incomprehensible thing we call "mind." The processes of growth, of existence, of decay, whether in worlds or in the minutest organisms, are but motion.

TIMBER WASTE A NATIONAL SUICIDE.

"At a meeting held this 29th day off Aprill, 1699, in Breucklyn (Brooklyn), Benjamin Van de Water, Joris Haussen, Jan Garritse Dorlant" were chosen officers to consider the "greate inconvenience and lose" that the inhabitants of the town suffered because that unauthorized tradesmen "doe ffall and cutt the best trees and sully the best woods."

This appears to be the first step toward the first law promulgated in this country against the wasteful hewing down of timber: trees a proceeding recognized as an important waste, be it noticed, at a period when vast forests stood on the sites of our now most popular western cities, and when, so far as human knowledge of the continent went, the supply of wood might be inexhaustible. Since the date of this local ordinance, State legislatures and the general government have enacted laws carrying with them penalties, apparently of sufficient severity to deter the reckless use of the axe. The United States statute of March, 1875, imposes $500 fine or a year's imprisonment for wanton destruction or injury to, or the unlawful cutting of, "any timber tree or any shade or ornamental tree, or any other kind of tree" on national grounds; and $200 fine, or six months' imprisonment, for permitting cattle to injure trees and hedges on similar territory. Despite, however, the stringency of the various laws, their effect has not been to stop the waste, and the denudation of our timber lands continues at a rate which may be well deemed a matter of grave alarm.

In the very admirable statistical atlas prepared by General Francis A. Walker, Superintendent of the last census, appears a chart showing accurately the distribution of forests throughout the country. It seems to us that the government would do a good work if it would lithograph this map and scatter it broadcast, with copies of the statutes forbidding the destruction of forests, over the whole land; for it certainly shows, in a manner little less than startling, how very small are the heavily wooded tracts having 360 or more acres of timber to the square mile. Of the western domain, Nevada has no such districts, neither has Arizona, nor New Mexico, nor Texas, nor Colorado, nor Dakota, nor Nebraska, nor Kansas, nor the Indian Territory. In fact, considering the whole face of the country, there is a patch of heavy forest in Maine and New Hampshire, a small one in New York, large areas covering half of Minnesota, Wisconsin, and Michigan; the largest tract of all is located in the far northwest corner of the country; and there are heavily-wooded districts in Florida, Georgia, Alabama, Tennessee, Virginia, and the Carolinas. After eliminating these widely separated regions, the total area of which appears to be about equal to that of the Atlantic States, of the remainder of the country (fully four fifths of our whole territory), one half has no timber at all; the map shows a uniform blank.

Although there are no available statistics to show the exact rate of speed with which we are using up our wood supply, it is easy to see that we are doing so with great rapidity. Taking the legitimate use of lumber alone, industries based on its manufacture constitute the second in point of magnitude in the country, and are only exceeded by the iron interest. About 150,000 persons are employed in producing sawn lumber alone; $143,500,000 are invested therein, and 1,295,000,000 laths, 3,265 000,000 shingles, and 12,756,000,000 feet of timber are yearly manufactured. Considering next in order the secondary industries based on the use of lumber as a raw material, carpentry, cabinet making, shipbuilding, and so on through all wood workers, we shall find millions of our people employed. Now add to this Professor Brewer's assertion that wood forms the fuel of two thirds the population, and the partial fuel of nine tenths the remaining third, and some general idea will be obtained of the enormous drain upon our forests that is constantly in progress. If we restricted our use of wood to manufactures and its limited employment as fuel; in other words, if we rigidly cut off every source of waste, did not burn forests to render the land fit for agriculture, and took proper measures to prevent those forest fires of unknown origin which, just at present, are a colossal source of waste, and if we constantly planted trees: the timber yield would, without doubt, be practically sufficient for our needs for some long period to come. But this is exactly what we are not doing, and as a result we are drifting to a condition which few adequately realize.

With these considerations before us, it is easy to foresee that, with the disappearance of the forests, the conditions of all our territories will change, and that eventually, when the land no longer becomes suited to the needs of our descendants, then gradually but surely they will abandon it. It may take centuries for this to be brought about, but not many, if the present rate of waste be maintained; and thus we are led to face the fact that a period, so near as to be practically tomorrow, as compared with the history of the race, is at hand when our existence as a nation will end.

SHALL WE UNDERGO DISSECTION?

To yield up our lives for the advancement of Science is something that few of us would be willing to do, but to yield our bodies as a sacrifice on the altar of truth and knowledge, after we no longer have any use for them, is not a very hard thing; and therefore we are not surprised to read that a society has been formed in Paris, the members of which bind themselves, by a special testamentary disposition, not to be interred after death. Their bodies are to be delivered to the dissecting rooms of the various medical schools for dissection.

The cremation fever of 1873–4 accomplished something in the way of making people more indifferent to the disposition of this earthy tabernacle when life has fled. There were thousands of people who had firmly resolved that, if the projected cremation societies had their furnaces in successful operation, they would "give their bodies to be burned." The cremation cry is smoldering, the cremation corporations have turned to smoke and vanished in thin air, the gasmen will not take our carcasses, and what are reformers to do? They are now offered the expedient of our Paris friends, who invite them to throw themselves on the dissecting table, and be of some use to the world after they are dead, if they never have been before. We are not afraid that the whole world will follow this example, and flood the market with useless corpses. There will still remain those who desire an old-fashioned burial. The scarcity of subjects in many countries at the present time, the attendant necessity of working on those in an advanced stage of decay, and the premium offered in some localities to body snatchers are a few of the reasons that may be advanced in favor of the formation of mutual dissecting societies. One of the great objections urged on moral grounds against cremation, that it would shield crime by destroying its chief witness, does not apply to dissection. The first duty, of the student into whose hands the body fell, would be to determine beyond a doubt the cause of death. If this fact alone did not deter the poisoner or malpractioner from his nefarious work, it would at least have the effect of bringing to light many crimes which now are hidden without any suspicion being aroused. It might even prove a protection to a man's life to be known as a member of a mutual dissecting club.

PATENT MATTERS BEFORE CONGRESS.

Our abstract of the patent bills now before Congress, given in another column, exhibits the opening raid of the sewing machine monopolists, proving that these indefatigable individuals, nothing daunted by repeated defeat in previous Congresses, are about to bring all their forces to bear on the present one. The country is indebted to Mr. Dobbins, of New Jersey, for the presentation of the Wilson petition, which aims at a third term of seven years for the feed motion patent, used in the Wheeler and Wilson and other machines. The effect of this job, should it succeed, will be to render the whole sewing machine trade of the country tributary to the owners of the patent, and thus to saddle the people with a most oppressive and irksome monopoly, but little less obnoxious and gigantic than the old combination; in fact, it is advocated by, and in the interests of, the same parties. The second term ended November 12, 1871, and every Congress since that date has been besieged to give the expired patent new life; but, to their credit, thus far they have refused. It is to be hoped that the bill will meet a like fate this winter. Senator Logan revamps the Akin and Felthouser sewing machine compensation grab, which the Congresses of 1873 and 1874 rejected. Both of the above measures are presumably well known to the older members of the National Legislature, and it behooves them to keep watch that no ingenious lobbying or parliamentary sharp practice results in the passage of either of the bills. For the benefit of newly elected members, who may be unfamiliar with the tactics of the sewing machine monopolists, a brief statement of the merits, or rather demerits, of their claim may prove suggestive. A. B. Wilson's patent was granted for one of the first abortive attempts to make a sewing machine. This patent was construed to cover all styles of feeding devices in which the cloth can be turned round the needle, or in which the cloth is fed between two clamping surfaces. It was extended for seven years, and then, for the small sum of $50,000, Wilson transferred all his rights to the trustees of the Wheeler and Wilson, Grover and Baker, and Singer companies, in the hands of which corporations the patent has proved an effectual instrument for the complete monopoly of the sewing machine business. Now because Wilson got but $50,000 for his patent, he asks Congress for another term of seven years for the benefit, there is but little doubt, of the same combination. Wilson might, from other capitalists, have obtained probably twenty times the above named sum for his rights; but so large a consideration would not look so well when the next application to Congress for a second extension was to be made, so the payment of a small amount to the patentee was a necessary part of the job.

In previous years, members of the lobby have been unsparingly retained, and large sums have been spent in attempts to secure a passage of the bill. It is probable that still further and more determined efforts will be made this year. It remains, then, for every congressman who has the interests of his constituents at heart to scrutinize keenly and narrowly every move made by those who are manipulating this gigantic extortion, and to oppose its progress by his vote at every point. It remains, beside, for the people to let their representatives understand their will in this matter in a way that cannot be mistaken. As matters stand now, the patent is public property, free to all users; the door is open to fair competition, and the sewing machine, which has been somewhat reduced in price since the expiration of the patent, will be furnished to the public at a still lower price when the manufacturers outside the ring are insured, against injunctions and suits by the monopolists, by Congress rejecting the petitioner's application. Every housewife, every seamstress, every philanthropist, is interested in having all bills defeated which have for their purpose the protection of any combination of sewing machine manufacturers.

We shall watch with interest the discussion and votes on these bills when they are reported from the committees.

THE ATLANTIC FERRY.

The *Herald* has published an excellent report of the steamship lines plying between New York and Europe, with the names and tunnage of all the vessels, the number of trips made by each line, the number of passengers carried, the amount of freight, and other particulars of interest in regard to the character of the vessels, the kind of merchandise carried, quick trips, the improvements made in the different fleets, etc. We select from the report the following items of information:

The oldest line is the National, plying between New York, Liverpool, and London. It employs 12 iron steamers, full powered and among the largest in the service, having an aggregate tunnage of 51,486 tuns. These vessels made, during the year 1875, 81 regular trips, carrying 25,531 passengers and 464,709 tuns of cargo.

The Cunard Line—New York to Liverpool—employs 17 vessels, aggregating 53,200 tuns, and made 206 voyages, carrying 15,000 cabin and 27,550 steerage passengers, and 465,000 tuns of cargo. The quickest passage from Queenstown to New York was made by the Russia in 8 days and 14 hours; the quickest eastward was by the Scythia in 8 days and 10 hours.

The White Star Line—New York to Liverpool—employs 6 vessels, with an aggregate tunnage of 25,251 tuns. During the year they carried 24 100 passengers (5,174 in cabin), and 185,000 tuns of freight. They made 50 trips in all, the fastest by the Germania in August, time 7 days, 22 hours, and 8 minutes. In October the Adriatic made the run in 7 days, 22 hours, and 57 minutes.

The Anchor Line—New York to Glasgow and the Mediterranian—employs 27 vessels, with an aggregate tunnage of 57,289 tuns. They made 87 voyages from New York, 53 from Glasgow to New York, and 37 from Mediterranean ports to New York, carrying in all nearly 20,000 passengers (cabin 4,569, steerage 15,363), and 341,723 tuns of cargo.

The Inman Line—New York to Liverpool—employs 13 vessels, aggregating 42,975 tuns. They made 55 trips each way, 110 in all, and carried 300,000 tuns of cargo, and 34,389 passengers, 6,592 of them cabin passengers. The fast trips were, by the City of Richmond from Sandy Hook to Queenstown, 7 days and 18 hours; by the City of Berlin, westward, 7 days, 18 hours, and 2 minutes; eastward, 7 days, 15 hours, and 48 minutes.

The Hamburg-American Packet Company—New York to Hamburg—employs 15 vessels, which carried nearly 30,000 passengers (cabin 7,426, steerage 23,496), and 137,000 tuns of merchandise.

The North German Lloyds—New York to Bremen—employs 15 vessels, aggregating 48,710 tuns. They made last year 51 trips each way, carrying in all over 30,000 passengers (cabin 6,935, steerage 23,748), and 114,500 tuns of cargo. The best time made was 9 days and 10 hours.

The new State Line—New York to Glasgow—employs 7 vessels, aggregating 17,000 tuns. They carried 4,900 passengers and 48,900 tuns of freight from New York. Number of trips and amount of freight from Glasgow not given. Quickest trip, 9 days and 15 hours.

The Williams and Guion Line—New York and Liverpool—employs 6 vessels, aggregating 22,360 tuns. They made 38 trips each way, and carried 150,000 tuns of cargo: number of passengers not given.

The French Line—General Transatlantic Company—New York to Havre—has 6 vessels, aggregating 24,300 tuns. They made 28 trips each way, and carried 6,900 passengers.

The whole number of passengers carried by all these lines was about 225,000, and the freight over 2,000,000 tuns.

Mineral Wool.

The method of manufacture at the Krupp Works, Essen, Prussia, is as follows: The pig iron furnace is provided with a tap an inch in diameter, out of which a continual stream of slag is allowed to flow and to fall a distance of 2 feet 6 inches, at which point the falling stream of slag is met by a strong blast of cold air, the effect of which is to separate the slag into myriads of hairlike threads, as white as snow, resembling the finest wool. These fibers, like spun glass, if handled, will penetrate the skin. The mineral wool is used for packing steam pipes, boilers, etc., and is a valuable product.