At last all was made clear. The forceps, then red hot from their grip of the plate, were drawn away, the chains cleared from the rollers, and, with a great hurrah, the other workmen seized the chains attached to the iron truck, and drew it to the incline by main force, where it was left by its own weight to run into the jaws of the rolling mill. It was then *sauve qui peut* among the workmen, who rushed for shelter in all directions as the mass was nipped between the rollers, and wound rapidly in amid quick reports like those of dull musketry, as the melted iron was squeezed by the tremendous pressure out of the mass, and flew out in jets of liquid fire on all sides. In spite of all the care and all the skill which the best workmen can use on these occasions, they cannot always escape the splashes of melted iron, and the burns inflicted are numerous and often severe. The turning of the rollers crushes the plate through to the other side, where it rests for a minute on a wrought-iron truck similar to that on which it was brought from the furnace. The action of the rollers is then reversed after they have been by the action of screw levers brought closer together by about an inch. These again nip the plate and drag it back in an opposite direction, and again and again does the mass go forward and backward, each time passing between a smaller space between the rollers, till, as on Friday, the whole of the huge thickness was reduced to a compact mass fifteen inches thick, in less than a quarter of an hour. During every stage of the process, quantities of fine sand are thrown upon the plate, and this literally takes fire as it touches the flaming surface, and covers it as it melts with a coat of silica, or with a glaze like that of earthenware. After every discharge of sand, and these go on almost incessantly, buckets of water are thrown upon the plate and explode in clouds of scalding steam, and when these are partly dissipated men rush forward, and with wet besoms with handles twenty feet long sweep off whatever little scraps of oxydation may have taken place. Thus every time the plate passes through the mill the sand is scattered, the water thrown, and the surface swept, and at every roll the chief roller of the establishment runs forward, and, under the shelter of wet cloths, measures with a gage its thickness from end to end. On Friday the required dimensions were obtained, as we have said, by less than a quarter of an hour's rolling, and a plate 15 inches thick, the product of the labor of nearly 200 men and of the consumption of nearly 250 tuns of coal, was shot out by the rolling mills and left to cool. When this had been effected two large rollers of iron, each weighing 15 tuns, were placed upon it by the cranes, and moved slowly backward and forward, and, eventually, as the plate cooled, were left upon its ends to keep the whole perfectly level. Nothing further now remained in order to complete it as the finest specimen of armor plate manufacture ever attempted, but to plane off its rough ends and edges. The flat surfaces on either side, which form what is called the skin of the plate, are never interfered with, for the action of the steel rollers leaves them literally almost as smooth as plate glass.—*London Times.*

ON THE NATURE OF PROPERTY IN PATENTS.

As we investigate the history of patents, perhaps no question at once so elementary and so embarrassing presents itself as that concerning the nature of the property acquired by the holder of a patent. Its solution might furnish analogies which would turn the scale of many a well-balanced case, and the want of a ready answer has been often palpably felt and deprecated. And yet, notwithstanding the importance which seems to gather around the subject, few seem to have groped into the apparent darkness, while conjectures, often contradictory and evidently founded upon first impressions or general principles, have (when the subject has not been carefully shunned), been lightly hazarded. While one eminent jurist in this section of the country confidently asserts that a "patent is a compact, and an executory one at that, rather than a deed of property," and that "its vitality consists in making good by the patentee certain provisions which are of the character of conditions subsequent," (Betts, J., in Smith *vs.* Higgins, N. Y., 1857,) another almost at the same time and in an opposite section declares that "a patent may be consid- in the light of a deed from the government," conferring vested rights and present privileges. (Wilkins, J., in Page vs. Ferry, Mich. 1857). While one distinguished commentator affirms that "a patent is of a metaphysical nature, and exists merely in idea and abstract contemplation, and is in fact a naked right, which if the patent itself did not make it assignable, would be inseparable from the person of the grantee, and that it may properly be defined as an incorporeal chattel, impressed with the character of personal estate," (Hindmarch on Patents, 233,) a second learned writer on the same subject scrupulously avoids committal on this point.

We shall briefly endeavor, by tracing the rise and embodyment of property in patents, and by observing the most approved divisions of property according to its nature, to locate this seemingly wandering Pleiad in that group which its essence and incidents point out, and thus indicate some of the most obvious and generally interesting consequences which flow from its position.

The fundamental idea of a patent, aside from the incidents which the policy of wise governments have grafted upon it, is *a grant by government of the exclusive privilege of enjoyment of a new and useful manufacture.* The right to confer this privilege seems from a very early period to have been an acknowledged prerogative of the English crown. Thus in a case reported in the Year Books of Edward III., A. D. 1328, it is said that "arts and sciences, which are for the public good are greatly favored by the law, and that the King, as chief guardian of the common weal, has power and authority by his prerogative to grant many privileges for the sake of the public good, though *prima facie* they appear to be clearly against public right." (Year Book, part IV., 40 Edw. III., fol. 17 and 18.) And in the celebrated case of Monopolies arising in the reign of Elizabeth (Darcy *vs.* Allen, Noy. R., 182), it is recited that "In the time of Edward the Third some alchymists persuaded the King that a philosopher's stone might be made, and the King granted a commission to two 'fryers' and two aldermen to inquire if it were feasible, who certified that it was, and the King granted to two aldermen a patent of privilege, that they and their assigns should have the sole making of the philosopher's stone."

In the case of Darcy *vs.* Allen (supra), it was also said that "When any man, by his own charge or industry, or by his own wit or invention, doth bring any new trade into the realm, or any engine tending to the furtherance of a trade never before used and that for the good of the realm, that in such cases the king may grant to him a *monopoly patent* for some reasonable time." (See also Bacon's Abr., Title Prerogative.) From these cases and some others which could be cited, and all of which occurred anterior to the earliest English statute on the subject (21 Jac., I. c. 3), it is evident that this power of the Crown was recognized by the common law as existing prior to and aside from any statutory provision.

It is extremely probable that the exercise of this important branch of the prerogative took its rise from the farsighted policy of the Saxon Alfred, in days when the wisdom of a monarch was more potent than the venal partisanship of the "*wittena-gemote*" or Parliament, and was perhaps earliest applied, at the then low ebb of invention, to the encouragement of the importation of foreign arts and sciences, which is known to have been greatly favored by Alfred, and a provision for which is still preserved in the present English statutes. (Asser. p. 20; Hume's History of England, Vol. I., p. 767.)

At all events, it was no mere stretch of arbitrary power which an enlightened age has toned down to harmony with other civil regulations, but appears from the very first to have been designed as well for the benefit of the people at large, as for the emolument of the inventor. Taking a brief review of the definition of a patent, we find that a patent for an invention is a *grant* conferring upon its possessor a vested right of property, as distinguished from an executory contract, and of which he can not be constitutionally deprived. It is also said to be a grant from the mode of its conveyance, it being possible to convey incorporeal property only by grant. It is a grant too *by government*, under a power inseperably annexed to it (3 Shep. Abr. Prerog., p. 67 and 59; Jenkins, p. 304; Skin., 606; 1 Hawk. P. C., c. 70), though it may be vested in different departments according to the nature of the state; thus in England, as we have seen, it is an adjunct of the Crown, as the supreme executive and originator of the power, while under our own constitution Congress is made its repository, as the successor in this particular to the English kings. But it is also a government grant of an *exclusive* nature, of the character of a monopoly, shutting out all others from participation in its benefits, excluding them from that to which they would otherwise be entitled, and conferring upon its possessor appropriate remedies.

It is also in its nature a *privilege*, as distinguished from something demandable of right, and is only conferred in answer to petition, and as a matter of grace and favor, (Hindmarch on Patents, p. 4; Act 1792, sec. 1; Act 1793, sec. 1; Act 1800, sec. 1; Act 1836, sec. 6), though now invariably granted, and compellable from the Commissioner of Patents, whose duties are prescribed by statute. (Whitney *vs.* Emmet, Bald. 318; Hildreth *vs.* Heath, Ms. App. Cas.; Grant *vs.* Raymond, 6 Pet. 241.) This government grant of an exclusive privilege is also one, in general, of unrestricted *enjoyment.* The possessor is confined to no one mode of employment, but may use, make, or vend his invention without restriction, or (except in the case of a foreign inventor) may confine it wholly to himself.

That the grant must also be for a *new* manufacture, is so elementary a proposition as to need no illustration, though its full explanation may be properly reserved for the text book, and the quality of *utility* is an equally necessary and obvious ingredient, though its amount may be small (Morgan *vs.* Seward, 1 Webs. 172, 186), and ideas of its nature have been greatly modified since the early history of the grant of patents, when Lord Coke in his Third Institute of the Laws of England, recites with evident approval, "that there was a new invention found out heretofore that bonnets and caps might be thickened in a fulling mill, by which means more might be thickened in one day than by the labors of fourscore men who got their living by it, and it was ordained that bonnets and caps should be thickened and fulled by the strength of men and not in the fulling mill, for it was held inconvenient to turn so many laboring men to idleness." A decision a trace of whose spirit even at our day we see, fostered by ignorance, and cropping out at the suggestion of demagogues. To complete the brevity of the definition, the word "*manufacture*" has been held to include all of the various terms used in our patent law. (Curtis on Patents, §69.)

After this survey of the nature of the patent grant, we shall be more ready to recognize its similitude to other branches of property, and assign to it its proper station if discoverable.

All property is divided principally into two great classes, real and personal, and a third and much smaller division, partaking of the nature of both, called "mixed" property. Real property is said by the most approved text writer to consist of lands, tenements, and hereditaments; and hereditaments are further separated into corporeal and incorporeal hereditaments. The definition of real property by the word hereditament is, however, incorrect, for so far from being a part or subdivision of, or even a synonym for, real property, it is in fact a word of far wider signification, being nearly, as is said by Chancellor Kent (but with perhaps too great latitude), as comprehensive as the word property. (3 Kent Com. Lect. LII.) It however includes whatsoever may be inherited, real or personal, or mixed (1 Co. Inct. 6; 3 Kent Lect. LII.; 2 Blacks, p. 17), and as such may be applied to a mere movable chattel, such as an heir-loom. (3 Rep. 2, Norris *vs.* La Neve, 3 Atk, 82. But see New York Code of Procedure, sec. 462.)

After separating hereditaments into those of a corporeal and those of an incorporeal nature, our authorities further distribute incorporeal hereditaments, which are defined to be rights issuing out of or annexed to things corporate, into classes, among which we find "commons, ways, offices, franchises, pensions, annuities, and rents." Of these subdivisions, it is submitted that that of "*franchises*" includes our subject matter, and if its essential qualities appear the same, must of necessity carry with it by analogy its incidents and liabilities.

As we trace the adjudged qualities of a franchise, we meet at every step the characteristics of our modern Letters Patent, as we have heretofore traced their nature. "A franchise or freedom," says Sir William Blackstone, "is a royal privilege, or branch of the king's prerogative, subsisting in the hands of a subject" (2 Blacks. 37; Finch 38, 164-6; 3 Cruise, Dig. 278, tit. 27, sec. 1; People *vs.* Utica Ins. Co., 15 Johns. 386), and must arise by grant from the Crown. (*Id.*) This quality we have already traced in the rise and progress of patents. (To be a corporation is a franchise, as is also to have treasure trove, deodands, or the right to take tolls, etc.) It seems, too, that the words "Royal privilege" are to be used in an objective as well as a subjective signification, and to include not only that which the Crown can alone primarily enjoy, but also that which the Crown alone can grant. (People *vs.* Utica Ins. Co., 15 Johns. 386; Burrill Dic. Tit. Franchise). And it is in this sense, perhaps, that the patent right as well as one of the most important and common of royal grants of privilege, that of existing as a corporation, is said to be a franchise.

The same identical franchise can not be granted to more than one person (2 Roll. Abr. 191, Keilw. 196), and herein we see the exclusive nature of the patent. (But see case of Chas. R. Bridge *vs.* Warren Bridge, 11 Pet. 420, a decision which seems rather the offspring of modern necessities than the strict adherent of precedent. See opinion of Story, J.)

There must be a consideration for the grant of a franchise in the benefit conferred on the public or otherwise, for unless it has a reasonable commencement it is illegal and void (2 Inst. 22), a provision evidently corresponding to the requirements of novelty and utility in a patent. The mode of protection of the grantee of a franchise is by action on the case for the invasion, and by injunction (22 Henry II., 146; 2 Roll. Abr. 146; Tripp *vs.* Frank, 4 T. R. 666; Newburgh Turnpike Co. *vs.* Miller, 5 Johns. Ch. R. 111), the well-known safeguards of a patentee.

A patent, though an incorporeal hereditament, is however strictly on principle personal property, having none of the attributes of permanency and immobility which characterize real property. (2 Blacks., ch. II., p. 15.) Nor does the fact that our statutes make the rights conveyed decensible to the heir instead of the executor (Act of 1836, sec. 5) render this any the less true, for, as we have already seen, an incorporeal hereditament may issue out of or be annexed to chattels, and be real only in its quality of descent. (3 Rep. 2; 1 Co. Inst. 6; 3 Kent Lect. LII.; 2 Blacks. 17; but see code, §462.) The English grants indeed name the executors, administrators, and assigns of the inventor, but this seems to have been an engrafted quality, for the "inventor" alone is mentioned in the Statute of Monopolies. (21 Jac. 1, c. 3, sec. 6.)

We submit, therefore, that the property acquired by letters patent for an invention, in this country at least, may be defined to be an incorporeal hereditament, called a franchise, of a personal nature, for it consists of rights issuing out of and annexed to the corporeal letters patent or grant of the government, decensible to the heir, and joining to the origin, consideration, nature, and exclusiveness of a franchise, the mobility of personal estate, and we therefore proceed to trace some analogies between it and kindred branches of property.

Shares in the franchise of an incorporated company are incorporeal hereditaments, each shareholder being said to hold a franchise (2 Blacks., p. 37), and, like the patent privilege, some of these have been held to pass to the heir, and in that particular partake of the character of land. (Dryteutter *vs.* Bartholemew, 2 P. Wms. 127; Buckridge *vs.* Ingraham, 2 Ves. Jr. 651; Price *vs.* Price, 6 Dana, 107.) Yet it is perhaps better to consider them as of the nature of a transmissible and assignable franchise of the personal kind. (Judge Sharswood, Notes to Blackstone, Bk. 2, p. 15, n. 1.) As a general thing, however, in established companies they superadd the character of evidences of debt, which is not to be confounded with their primary nature.

Perhaps the most striking parallel to the conjunction of the inheritable characteristic of real property with personal property is to be found in the case of an annuity granted to a man and his heirs, but chargable only on the person of the grantor, and in the analogous English property in a "corody." An inheritable annuity (not charged on lands) is said by Lord Coke to be a fee simple *personal* (Co. Litt. 2 a.), and though it is forfeitable for treason as a hereditament (7 Rep. 34 b), yet it is not a hereditament within the statute of mortmain (7 Edw. I. st. 2; Co. Litt. 2), and is not entailable. (Case of the Earl of Stafford *vs.* Buckley, 2 Ves. Lr. 170.)

The right to take tolls, another incorporeal hereditament, may be likewise mentioned as an analogous class of property, especially in the mode of its enjoyment (Vose *vs.* Singer, 4 Allen, 226), for as patents are often made profitable by the imposition of a royalty, this royalty is in the nature of a toll for the use of the patent.

There is perhaps some faint analogy, too, between a patent right and a right of way, for it is an exclusive right of way

in the region of invention secured to one for a limited period as a compensation for having first discovered it, (Vose *vs.* Singer, supra), something in the spirit with which Spanish arrogance once interdicted traffic with the new-found world

It would be impossible, however, within the scope of this article to do more than locate in its proper family this species of property, leaving to the keen decision of practical test the determination of the names and nearness of its kindred. If we have at all resolved intricacies pertaining to the subject, and at least pointed out the paths to further illustration, our immediate object will have been attained, and we shall leave to ampler time the consideration of the numerous incidental questions to which the main interrogatory has given birth.

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

The Galvanic Battery.

Messrs. Editors:—I have been shown a back number of your journal containing a letter from Mr. M. G. Farmer in which he ably and clearly shows that the cheapest source of powerful electric currents of large quantity and intensity is mechanical force, in other words, coal or solar force.

In his letter he makes the following remark: "It is well known that a galvanic battery will perform its maximum work when the external resistance which it encounters is equal to the internal resistance of the battery."

This statement is approximately correct and would be strictly—mathematically—correct did the electromotive force of the battery remain constant. Unfortunately many students draw a wholly wrong conclusion from the above statement which is derived from Ohim's "Theory of Electricity."

I have found when in conversation with many on both sides of the Atlantic that a very general impression prevails that for telegraphic and almost all other purposes the best and most economical results are obtained when the internal and external resistances are equal. That this is not the case will be evident by referring to Ohim's law, viz., "If the electromotive force of the battery be E, the resistance of the battery be B equal internal resistance; the resistance of the circuit, R equal external resistance; the quantity of electricity in motion through the battery and circuit equal Q, then the value of Q will be $\frac{E}{B+R}$

Now if B equal R it is evident that half the work of the battery is expended in overcoming the resistance of the battery itself, producing useless heat, the other half only being available for actual work. If now the question be put "how can a given quantity of zinc and acid be made to produce the maximum amount of external—that is useful work?" it will at once become evident that could the resistance of the battery equal B be reduced to nothing the whole work would be expended in R; in other words could the resistance of the battery be got rid of entirely the whole, that is twice the amount of external work would be produced from the same amount of zinc that was possible when the external and internal resistances were equal. Therefore, in all cases, the resistance of the battery itself should be but a small fraction of the total resistance of the circuit in order to work economically.

There is, however, another reason why the latter should be the case. When a battery works hard the solution near the negative plate is reduced in strength by the decomposition going on and the result is a decrease of electromotive force so that E ceases to be a constant quantity in the above equation.

The variation of E is different in different batteries and the result is that with a Daniel's battery 50 cups whose total resistance is one-twentieth part that of the circuit will produce as much current as 100 cups whose total resistance is equal to that of the circuit. In the former case the consumption of zinc and sulphate of copper will be just one-half that in the latter (local action or waste being excepted.)

The resistance of a telegraphic circuit is varying continually by defective insulation and change of weather, consequently in wet weather when the greatest current is wanted the resistance of the line or circuit is at its minimum and therefore if the battery's resistance be a large fraction of that of the circuit at the very time when the most power is wanted a larger portion than usual of the battery's force is expended in itself. Hence great variability of currents in the circuit.

In conclusion the best, most regular, and most economical results are obtained when the internal resistance of the battery is very small compared to that of the external resistance.

Cromwell F. Varley.

Chicago, Sept. 20, 1867.

Case Hardened Iron as Steel.

Messrs. Editors:—Is there any invention or process patented by which iron, by the simple process of case hardening, can be made to answer all the advantages that steel has over iron in a mechanical sense?

I claim to take a piece of good iron and case harden it, and it shall work under the smith's hammer the same as steel, and shall bear annealing, working, and hardening, the same as steel, and do all that steel can do in the form of taps, chisels, hammers, punches, files or any other article that steel is used for.

F. C. Curie.

Lancaster, Pa.

May not our correspondent use the term case hardening for that of converting or cementation? Case hardening, in its results, is, chemically and practically, the same as the ordinary method of converting iron into steel, only not carried so far. The outer portion of the iron, in case hardening, becomes steel, frequently to a measurable depth. If by a quick process of case hardening or converting our correspondent can make good steel from good iron, it ought to be valuable. It is well known that a thin piece of iron, or a small iron wire, can be converted by the process known as cementation. It is quite common among machinists to make large taps of wrought iron, and after they are finished, to case harden them, when, if properly done, they work well.—[Eds.

Lightning Conductors.

Messrs. Editors:—Not having been able to be more than an occasional reader of the Scientific American, since the collapse of our cause, my attention has not been heretofore called to your article on "Lightning Conductors," in Vol. 16, No. 20, May 18, 1867. As it inculcates an error which is of some practical importance, I beg leave to make the correction.

Speaking of metals, you remark: "The conducting power lies in the surface; a tube is as efficient as a solid rod of the same diameter, and a strip or ribbon, which presents the same amount of surface, is equal in power."

Now, the opinion that the conducting power of metals for electricity is proportional to the extent of surface, is a common popular error. The numerous itinerant lightning-rod men, who perambulate the "area of freedom," are always fortified with certificates perpetuating this physical error. I cannot imagine how such a mistake originated, unless the law of distribution of statical electricity on conductors has been confounded with their conducting power.

No law of electricity is better established, or rests on a more secure experimental basis, than that, for any given metal, the conducting power varies directly as the area of a cross section, and inversely as the length; or, otherwise, conducting power varies as $\frac{\text{Area of cross section.}}{\text{Length.}}$

For the experimental proofs of this law I refer to any of the standard treatises on electricity, as De la Rive's or Becquerel's.

The same law is true, as might have been expected, for Voltaic electricity. In fact, Ohm's law, and the formula which is founded on it, express the same truth. In this form, the accuracy of the law has been tested in the most rigorous manner.

The practical bearing of this law is obvious, as well as important. The "ribbon form" of conductor, which you recommend, will not answer; for the amount of metal, or area of cross section, would not be sufficient. Even your "copper ribon" would, probably, be fused and dissipated under an ordinary stroke of lightning. The rod must have metal enough to carry the electricity; we gain nothing by spreading it out, or otherwise augmenting its surface.

I was glad to see that you exposed the popular fallacy in relation to "insulating the conductor from the building." These glass and horn insulators are totally useless. Those who may be disposed to reject this opinion, will, nevertheless, appreciate the fact, that, when such insulators become wet, they are conductors, and are practically inoperative.

The influence of length on the conducting power, as indicated in the law above given, shows the importance of having the rod as straight as possible; for any increase of length diminishes its conducting power, and, consequently, its efficacy. For the same reason, very long rods should be larger than short ones.

Electron.

Science Familiarly Illustrated.

THE ART OF BALANCING.

The feats of skill performed in the circus, which in our boyhood excited our wonder and caused us to regard the actors as beings of a superior order, in after years may be legitimate subjects of study to the thinking mind. Look at the balancing performances. They appear wonderful. One of the "artists" gives a plate a twirl by the hand, throws it whirling into the air, catches it on the point of a sharpened stick, places the other end of the stick on his chin and balances it; then taking up another he repeats the process until he has perhaps six or seven spinning and balancing on head, face, and hands. Another climbs a pole and suspending himself on the top, his body horizontal, another carrying the pole and performer about, accurately keeping the equilibrium of both. Another performer walks erect on a tightened rope or wire, controlling his perpendicular and governing his progress by means of a long pole carried transversely across his body, thus sustaining himself on his narrow base by what is termed the equilibrium of forces. The "flying trapeze" is another exemplification of the art of balancing. The performer requires some judgment, a quick mechanical eye, but mostly constant practice.

Now all these public performances of professionals are equaled, if not surpassed by the successful efforts of the infant just learned to walk. A child of one year old who can just "toddle" about the room, unaided by chairs or the hands of its parents, gives a performance not in any way inferior to that for which people pay their money to witness. Think for a moment what practice—the exercise of judgment and the teachings of instinct can hardly be predicated here—is required to balance a top-heavy weight elevated so high—proportionally—from the base and that so small, and not only this, but to change from one base, or foot, to another rapidly, preserving meanwhile the center of gravity! It is as though a tall tower should be balanced alternately by its base on one side and then the other; and more than that, it has to adapt itself to inequalities of surface and move from one point to another. The slightest excess of momentum by the push or thrust of one point of support, would, according to the laws of mechanics, topple the whole structure over, and the line of gravity, passing beyond the base it would inevitably come disastrously to the earth. Yet in the case of the infant just beginning to walk—of course entirely ignorant of the laws of gravitation—the slight practice to which it has been subjected proves sufficient for it to rival the performances of those who "astonish the natives" in public entertainments.

With all our knowledge of mechanical contivances, we have never yet succeeded in reproducing this alternate balancing in mechanism. The walking doll is a very clumsy imitation, or simulated attempt at the ordinary process of walking, so common that we do not notice it. When machinery, built of rigid metal, can be made to imitate, successfully, the ordinary movements of the animal organism, we may consider a new door opened to mechanical inventors, but it is doubtful if we shall ever arrive at such a stage of mechanical perfection as this.

Concerning Man.

Wonders at home by familiarity cease to excite astonishment; but thence it happens that many know but little about the "house we live in"—the human body. We look upon a house from the outside, just as a whole or unit, never thinking of the many rooms the curious passages, and the ingenious internal arrangements of the house, or of the wonderful structure of the man, the harmony and adaptation of all his parts.

In the human skeleton, about the time of maturity, are 165 bones.

The muscles are about 500 in number.

The length of the alimentary canal is about 32 feet.

The amount of blood in an adult averages 30 pounds, or full one-fifth of the entire weight.

The heart is six inches in length and four inches in diameter, and beats seventy times per minute, 4,200 times per hour, 100,800 per day, 36,772,000 times per year, 2,565,440,000 in three score and ten, and at each beat two and a half ounces of blood are thrown out of it, one hundred and seventy-five ounces per minute, six hundred and fifty-six pounds per hour seven and three-fourths tuns per day. All the blood in the body passes through the heart in three minutes. This little organ by its ceaseless industry.

> In the allotted span
> The Psalmist gave to man,

lifts the enormous weight of 370,700,200 tuns.

The lungs will contain about one gallon of air, at their usual degree of inflation. We breathe on an average 1,200 times per hour, inhale 600 gallons of air or 24,400 gallons per day. The aggregate surface of the air cells of the lungs exceeds 20,000 square inches, an area very nearly equal to the the floor of a room twelve feet square.

The average weight of the brain of an adult male is three pounds and eight ounces, of a female two pounds and four ounces. The nerves are all connected with it, directly or by the spinal marrow. These nerves, together with their branches and minute ramifications, probably exceed 10,000,000 in number, forming a "body guard" outnumbering by far the greatest army ever marshaled!

The skin is composed of three layers, and varies from one-fourth to one eighth of an inch in thickness. Its average area in an adult is estimated to be 2,000 square inches. The atmospheric pressure being about fourteen pounds to the square inch, a person of medium size is subjected to a pressure of 40,000 pounds! Pretty tight hug.

Each square inch of skin contains 3,500 sweating tubes, or perspiratory pores, each of which may be likened to a little drain-tile one-fourth of an inch long, making an aggregate length of the entire surface of the body of 201,166 feet or a tile ditch for draining the body almost forty miles long.

Man is made marvelously. Who is eager to investigate the curious, to witness the wonderful works of Omnipotent Wisdom, let him not wander the wide world round to seek them, but examine himself. "The proper study of mankind is man."—*Cin. Journal of Commerce.*

Burns.

In regard to the treatment of burns there is a great diversity of opinion, scarcely any two surgeons agreeing as to the remedies. All of them are doubtless valuable, but there is one which has a great reputation, carron oil, limewater, and linseed oil. The great objection to it is its offensive odor, rendering an entire ward disagreeable. When the burn is very superficial, simply inflaming or vesicating the part, covering it up with flour, and then placing a layer of cotton over it so as to exclude the air, makes a very comfortable dressing. Another method consists in applying cold water, and another warm water covered with oiled silk and a bandage. Lard, deprived of salt, and simple cerate make pleasant applications. The profession is indebted to Prof. Gross for the introduction of white lead and linseed oil in the treatment of burns. It is one of the very best applications which can be used, effectually excluding the air, and being always grateful to the patient. In all cases, no matter whether merely the skin or the deeper structures are involved, white lead rubbed up with linseed oil to the consistence of paste or paint, and placed on with a brush, will be found productive of great relief. There does not appear to be any risk from the constitutional influence of the lead, though it has been suggested, to counteract any tendency of this kind, that the patient should take occasionally a little sulphate of magnesia.—*Medical and Surgical Reporter.*

Extraordinary Coincidences.—The diameter of the earth multiplied by 108 gives the diameter of the sun; the diameter of the sun multipled by 108 gives the mean distance of the earth from the sun; and the diameter of the moon multiplied by 108 gives the mean distance of the moon from the earth.