FURTHER NOTES ON THE NORTHERN ARMY WORM.

BY PROF. C. V. RILEY.

HOW FAR IS BURNING OVER A PREVENTIVE?

That fields which have been burned over in the winter are free from the destructive presence of the worm is a fact in the history of its visitations. But opinion has varied as to the precise effect produced by the burning over. I have shown that it destroys the appropriate nidus for the laying of the eggs by the moth in the spring. Now that larval hibernation is established, we can readily see that the fires would destroy these hibernating larvæ and prevent the appearance of the moths and of a second destructive brood from them. But we must not suppose that the burning over would prevent *all* appearance of the worm; it merely prevents its appearance in destructive numbers. The moth will, when exceptionally numerous, lay her eggs without concealment and upon plants, such as clover, which the larva does not relish.* In such cases of exceptional abundance we may well suppose that the moth will fly into fields which had been burned over and supply them with eggs, but the instances in which this would result in material damage to the crop would be very rare.

CONNECTION OF WET AND DRY SEASONS WITH ARMY WORM INCREASE.

That the army worm appears in destructive numbers after a period of dry seasons is a fact already recognized, and is in accordance with the experience of the present year. The portions of our country visited by the worm this year were afflicted with drought last summer, and the winter was remarkable for its mildness and the slight fall of snow. Fitch's theory of the appearance of the worm required that this spring should be a wet one in order to drive the moths from the swamps and cause them to lay their eggs on the upland. But the facts are just the reverse. Farmers from Virginia to Vermont have complained loudly of the excessive drought. Rivers in some of the Atlantic States have not been so low for a generation, and alluvial meadows which have been subject to a spring flooding have this year remained dry. These facts clearly disprove Fitch's theory, and we must believe that the army worm is most likely to appear after dry seasons, *regardless* of the wetness or dryness of the season in which it occurs. A critical examination of Fitch's arguments in support of his theory shows that he not only had no personal acquaintance with the worm, but also made some astonishing errors in meteorology, such as comparing the rainfall of India (?) with the appearance of the worm here. With equal reason might we argue that 1879 was wet in our Atlantic States because of the excessive precipitation in the British Islands during that year. It is evident that Fitch was hard pressed for arguments to support the theory. That the season of 1861 was remarkably wet in the Eastern States Fitch gives no evidence. From the well known connection of the presence of plant lice with dry seasons, and from the memorable depredations of the grain aphis in that year throughout the Middle and New England States, it is very questionable whether 1861 was wet. It is far more probable that the season was a dry one like the present, in which also various plant lice have done great damage.

The view that the army worm has its proper home in the wild grasses in the swamps, as Fitch has assumed, must also be considered erroneous. The moth prefers matted grass amid which to lay its eggs, and the more tender grasses are those first selected by the worms. Old neglected fields, whether their location be low or high, are the most natural breeding places for the insects. That the worms most often appear in low lands, or in the neighborhood of such, doubtless finds more correct explanation, first, in the highly probable fact that the parent moth gets more appropriate food at such places, either in saccharine exudations, the natural "sweat" of the plants, or moisture from the ground; secondly, in the well observed fact that such lands afford the greatest extent of neglected meadows where the insect has opportunity to multiply unnoticed and undisturbed.

Dangerous Freight.

A case marked "benzine" or "benzoline" exploded with terrific force on the Pacific Steam Navigation Company's steamer Coquimbo, at Valparaiso, recently. A breach nearly twenty feet in length was made in the side of the vessel, fortunately above the water line. One man was killed. The immediate cause of the explosion is not given. The carrying of such dangerous freight may have something to do with the too frequent disappearance of ships at sea.

American Ironware in New Zealand.

A former resident in Birmingham, England, writes from New Zealand: "I was much interested in noticing how your staple trades were represented here. One article your town stands unrivaled in—lamps; but in every other branch of the hardware trade the vigorous Yankees beat you. In agricultural and gardening implements, stoves, domestic notions, and the thousand and one articles of hardware, English makers are nowhere here. For quality, adaptability, and price, the American articles bear the palm. I was one day in the store of one of our leading hardware merchants, when a miner came in for a pick and shovel. He was asked which he would look at, English or American. 'Oh, Yankee tools for me,' said the man; 'English are too clumsy.' My friend explained that the English will persist in making the tools their grandfathers used."—*N. Y. Sun.*

DECISIONS RELATING TO PATENTS.

U. S. Circuit Court—Northern District of Illinois.

WHITTLESEY *et al. vs.* AMES *et al.* SAME *vs.* ZIMMERMAN. SAME *vs.* DEAN.—PATENT BEDSTEAD FRAMES.

Blodgett, J.:

1. Reissued letters patent No. 7,704, dated May 29, 1877, for an improvement in bedstead frames, declared to be for the invention embraced in the original patent, granted November 30, 1869, and claims 1 and 2 thereof construed, in view of the prior state of the art, and sustained.

2. A patent will not be defeated by evidence of prior similar devices which were of an experimental character simply and which were susequently destroyed.

3. Although the efforts of prior unsuccessful experimenters may have suggested to the patentee the construction which he finally adopted and perfected, and may have been of profit to him as far as they went, his patent will not be invalidated thereby.

By the Commissioner of Patents.

LOVRIEN *vs.* BANISTER *et al.*—APPEAL FROM THE EXAMINERS-IN-CHIEF.—INTERFERENCE.—PIPE TONGS.

Marble, Commissioner:

1. Where a patent has issued to two or more persons as joint inventors, and an application is subsequently made by one of them as sole inventor for a patent for the same invention, an interference will be declared, and the question of priority of invention will be determined by the weight of evidence, the burden of proof being upon the sole applicant to overcome not only the testimony of his adversary, but also his own former oath of joint invention.

2. The right of the sole applicant to a patent, where the testimony is conclusively in his favor, will not be precluded by the mere denial by his co-patentee of the fact of sole invention.

3. The decisions of the Commissioner in the case of *De Lill vs. Avery & De Lill* (C. D., 1870, p. 128) and the case of *Chase and White vs. Chase* (C. D., 1873, p. 99) commented upon.

Application of C. H. Lovrien, filed August 14, 1879. Patent No. 213,376 granted to H. Banister and C. H. Lovrien, March 18, 1879.

On February 10, 1879, Henry Banister and Charles H. Lovrien made an application as joint inventors for a patent for an improvement in pipe tongs, and on March 18, 1879, a patent was granted to them.

Charles H. Lovrien, one of the joint applicants and patentees, on August 14, 1879, filed an application as sole inventor for a patent for the invention already patented to himself and Banister jointly, and on September 16, 1879, an interference was declared between Lovrien, sole, upon the one part and Banister and Lovrien upon the other.

It is contended on behalf of Lovrien that the entire invention embraced in the patent and in this application was made by him alone; that he desired, however, that Banister, for a consideration, should have a half interest therein, and that by reason of his own ignorance of patent matters he allowed Banister to attend to the procuring of the patent, and supposed that the joint application, which he claims not to have carefully considered, simply secured to Banister his interest. Banister, on the other hand, claims that the invention was a joint one, and that it was so regarded by Lovrien at the time the joint application was made. The Examiner of Interferences decided priority of invention in favor of Lovrien, while the Board of Examiners-in-Chief held Banister and Lovrien to be joint inventors of the matter at issue, and decided in their favor.

The question to be determined in the case is clearly one of originality rather than of priority of invention. It is urged by counsel for patentees, and such appears to have been the ground taken by the Examiners-in-Chief, that where a patent has issued to joint applicants, and a sole application for the same invention is subsequently made by one of them, a patent cannot issue upon such application if the fact of sole invention is denied by the other party. Two decisions are cited in support of this position. In the first of these (the case of *De Lill vs. Avery & De Lill*, C. D., 1870, p. 128) the following language occurs:

"It is a matter of grave doubt whether one who joins another in an application for a patent, which he declares under his signature, verified by his oath, to be the joint production of himself and his co-applicant, ought ever be permitted to deny that oath and seek a sole patent. It would appear that a sound public policy would require that he should suffer the consequences of his mistake, even if it be innocent. But however this may be, it may be stated as a rule that wherever the facts are disputed the joint patent will not be disturbed. In the present case the burden of proof is of course upon De Lill to show that he was the sole inventor of the improvement covered by the joint patent. He must overcome his own oath, which cannot be treated as a nullity, and he must overcome the oath of Avery."

In the subsequent case of *Chase and White vs. Chase* (C. D., 1873, p. 99), Mr. Commissioner Leggett, in commenting upon the above decision, said:

"It was held by Commissioner Fisher in a similar case (*De Lill vs. Avery & De Lill*, decisions, 1870, p. 128), in substance, that a party to a joint patent was estopped from asserting his sole proprietorship where it was denied by the other party. I have no doubt of the soundness of this opinion. But certainly if this were not the case it ought to be clearly proved on the part of such an applicant that he was in fact a sole inventor. I concur with the board that 'Chase is very far from proving himself to have been the sole inventor.' The weight of evidence is decidedly the other way."

While from these cases it would appear that the ruling urged by counsel for the patentees was there made, yet in these very cases it is also seen that it was not followed, for in each a decision was rendered against the sole applicant, not upon the mere denial of the fact of sole invention by his co-patentee, but because the weight of evidence was found to be against him. Were I to give to these decisions the construction asked for by counsel for Banister and Lovrien, I should feel but little hesitancy in departing therefrom, as I fail to find, either in law or reason, any warrant for so arbitrary a rule. The Supreme Court of this district, in the case of *Ex parte L. O. Crocker* (MS. Appeal Cases, vol. 4, p. 269), held that where a patent had issued to two persons as joint inventors, and an application was subsequently made by one of them as the sole inventor of the same subject matter, the doctrine of estoppel did not apply, but the proper course for the Office was to declare an interference between the parties to determine the question of priority of invention, as in other cases.

In the late case of *Barsaloux, James & Lyon* (16 O. G., 233) the Attorney General used the following language:

"After a joint patent has once been issued upon an application of two or more persons as joint inventors, if the application erroneously described the invention as joint instead of sole, it is not, as I have just intimated, within the power of the Department to remedy the matter by changing the term of the patent already issued. The parties interested may file a new application, which, if seasonably done, can be made the basis for the issue of a new patent; but such new patent will not retroact by way of confirmation of the original."

If, then, a sole inventor is not estopped from making an application by reason of the fact that through mistake he has already applied for and obtained a patent for the same invention jointly with another, and if, as held by the court in the above cited case, an interference proceeding is the proper one in which the fact of such mistake can be determined, there can be, in my judgment, no sufficient reason for allowing the issue in such interference to depend upon the mere denial of one party, no matter how conclusive may be the proofs introduced by the other to rebut the same. The mistake of supposing that joint interest in an invention is the same as joint invention is a common one, to guard against which the Office has found it necessary to give notice in the rules that "the fact that one furnishes the capital and another makes the invention will not entitle them to make application as joint inventors; but in such case they may become joint patentees." Should a meritorious inventor, having made this common mistake, seek to have the same rectified by means of a sole application, the Office would readily declare an interference, which, under the ruling asked, would prove a mere nullity, if his co-patentee should prove dishonest enough to deny his rights. If the decisions cited are precedents for such a ruling, I must decline to be governed thereby. Undoubtedly, under familiar rules of evidence, the burden of proof is upon the sole applicant to show conclusively his right to a patent, and he is to overcome not only his adversary's testimony, but his own former oath of joint invention.

It appears from the evidence in the case that on the 23d or 24th of January, 1879, Banister and Lovrien first discussed together the invention in controversy. With regard to what occurred at this meeting the testimony is conflicting. Banister claims that Lovrien at that time suggested the cubical bit or block, while the adjusting screw and holding pin, both essential features of the device at issue, were supplied by himself. Lovrien, on the other hand, swears that he made the entire invention in controversy as early as the summer or fall of 1877, and at that time embodied the same in an operative device; that early in January, 1879, prior to his meeting with Banister, he disclosed such invention to others, and that on January 24, 1879, he fully communicated the same to Banister. This testimony of Lovrien as to the fact of his disclosure of the invention to Banister is contradicted by the latter, but is supported by the testimony of a party who was present at the time and who claims to have heard the conversation and to have seen the drawing made by Lovrien to illustrate his device. Further testimony is introduced by Banister to show that Lovrien regarded him as a joint inventor, and that he carefully considered and fully understood the joint application before the same was filed. This testimony, however, is not of a conclusive character, and is far from sufficient to overcome the direct and otherwise uncontroverted testimony of the several witnesses introduced by Lovrien to show that he had completed and disclosed to others the invention prior to his meeting with Banister, and which is fatal to the latter's claim as joint inventor. The weight of evidence is, in my judgment, clearly and conclusively in favor of Lovrien, and shows, beyond any reasonable doubt, that he had completed the invention long prior to his meeting with Banister, and such work as was done by the latter was but that of a mechanic and not of an inventor.

The decision of the Board of Examiners-in-Chief is accordingly reversed, and judgment is rendered in favor of Charles H. Lovrien.

* I have recently received from Professor Lintner, State Entomologist for New York, what are apparently the pressed eggs and egg shells of this moth, thickly covering clover leaves, and mixed with an abundance of white gummy matter with which the moth usually secretes them, all indicating that in this instance the moths (doubtless from excessive numbers) had "slopped over." Professor Comstock likewise informs me that he has found the eggs laid between the folded lobe of a clover leaf.

Aurora Borealis.

BY PROF. E. R. PAIGE.

The cause of this singular phenomenon has been a prolific subject of both scientific and unscientific discussion for many years.

To the mind educated in cause and effect the canopy of night, lighted up by the dancing specter, presents a most alluring sight. While the unenlightened are filled with dark forebodings of a visitation of God's wrath, the scientist sees only the grand workings of the immediate laws of nature. The heavens illuminated with red light is to the superstitious a sure harbinger of impending wars. While the careful observer looks with delight upon the scene, and is impressed only with the sublimity of nature, poor unreasoning man is tortured with fears of coming evil.

In the slow development of scientific knowledge many and varied have been the theories put forth as to the origin of the Northern Lights, as we in this hemisphere call them. It is the reflection of sunlight by the ice at the pole, says one, while another contends that it is produced by great and internal fires whose chimney occupies the space devoted by Dr. Kane to an open polar sea; but the more patient observers have pronounced it electric light. It is my present purpose to look out through the light of a few known facts in search of the origin of this great wonder. Not that any direct good will follow a successful inquiry in the matter of utilizing the light for street purposes or for private illumination, but if we can find the cause to be natural, and not supernatural, then one more old superstition that has haunted the memory and made life unhappy is gone—one more bugbear of tormenting fear is consigned to the shades of past ignorance. Newton discovered the law that controls the universe, and every child should be taught this law, for without it we can comprehend nothing in nature. How life is produced, how worlds, how suns and planets are formed and held in their orbits, is known only through this law.

"Each atom has an attraction for each other atom in the universe, and the attraction is proportionate to their size, and is lessened as the square of the distance which separates them increases." Late developments in scientific research lead to the conclusion that all the varied original elements in nature, so-called, are resolvable back to one, and that one to energy; also, that light, heat, electricity, and sound are only different phases of motion.

Heat is the arrest of motion, and all the warmth we get from the sun is produced by the stoppage of the heat waves sent out by its throbbing power. Chemical heat is created by the clash of little worlds of gas beating together, and no exception is known to the rule that heat is the arrest of motion.

All the heat and all the energy we get on the earth come from the sun. The rain clouds are lifted from the ocean; the winds sweep over the mountains and across the moors; the blood of life, the sap of vegetation, all propelled by the power of the sun. The visible power expended on our little globe passes all efforts of comprehension, but it is naught compared with the latent hidden energy. The decomposition of one drop of water produces a power equal to the most terrific thunderstorm ever witnessed, while the decomposition of one grain of water produces a force equal to the discharge of 800,000 Leyden jars. All this but shadows the vast amount of energy that comes to us from the sun. Our earth is but a speck in space, and not a two-thousand-millionth part of the energy thrown off by the sun strikes us, but is expended out in dark, empty space. This involves a vast waste by the sun, and experiments show that the sun would be exhausted and cooled down in 5,000 years if not replenished from some source. The earth is passing around the sun once a year over a path of 555,000,000 miles long, traveling at the rate of 68,000 miles an hour. The speed of our flight is eighty times more rapid than the swiftest flying cannon ball. If the globe should strike a dead wall passing at this great speed, the concussion, we are told, would burn it instantly, creating a heat of which we have no comprehension; and yet the heat produced by such a catastrophe would not be sufficient to last the sun's waste for a period of thirty days.

We are taught, however, that if the earth should let go its place in space and be attracted into the sun, that body being 325,000 times more than the earth, and, therefore, possessing 325,000 times more power of attraction, its immense pull would draw us in with such a velocity that the kinetic force gathered in the passage would produce an impact in striking that would give off heat sufficient to last the sun's waste for a period of ninety-one years.

In any hour of a clear night that we watch we shall see at least six or eight stars fall. These stars are simply small pieces of iron gathered and formed in space that have fallen into our atmosphere in our flight around the sun; that is, have been attracted into the orbit of the world and picked up. Coming into our atmosphere when it is passing with such velocity creates a friction—a concussion—an arrest of motion, that immediately burns the iron. We see the explosion and call it a falling star. If an unaided eye can see six fall in one hour of the night, then what a vast shower must be constantly attracted by the whole earth. If the little earth, with its slight power of attraction, brings in such a constant shower of cosmic matter, how much more would be attracted by the sun, possessing 325,000 times more power of attraction than the earth. Such is the case, we are told, and our grand constant shower of cosmic matter is constantly falling into that body, forming a vast corona extending out from the sun 800,000 miles, by the clashing and impinging of particles and resultant burning. Thus, by virtue of the law of attraction, one constant stream of matter, which is energy, is pouring into the sun to replenish its waste. This matter must be formed in space, and is simply an aggregation of energy, or fire-mist, that pervades the atmosphere.

The cosmic matter that falls on the earth—that is, meteoric matter—is about 85 per cent iron, and is merely an aggregation of iron dust, which is itself an aggregation of invisible fire-mist. Great clouds of this fine iron dust gather in the heavens, and are occasionally attracted into our orbit. On striking our atmosphere, flying with such great speed, the concussion, the arrest of motion, instantly burns the iron dust and produces light colored according to the surrounding conditions that produce the refraction. This theory is not without its objections, and the chief one is, perhaps, the fact of these lights occurring toward the poles. This objection, I think, can be met, however, in the conditions that produce refraction of light, but our article affords no space to enter upon that field.

The facts I have alluded to as a basis for reasoning are, of course, not my own, and I shall not be deemed immodest, I hope, in saying that they are all well established and may be accepted as true grounds of reasoning.

This being so, it does seem that the wonderful aurora borealis may be fully accounted for in the burning of iron dust that gathers into great clouds, and floats into our flying atmosphere to be burned by the concussion.—*Inter-Ocean.*

NICKEL PLATING.

THE PLATING BATH.

The nickel salts commonly used are the nickel-ammonium sulphate (called double sulphate) and the corresponding chloride. Other salts, such as the nickel potassium cyanide, the acetate and sulphate, have been used, but not so successfully as these.

The double sulphate bath may be prepared by dissolving three-fourths of a pound of the salt in each gallon of water (soft). The salt costs about sixty-five cents a pound, and is generally considered the best for this purpose. It should be kept neutral and up to about six degrees of hydrometer.

The double chloride bath requires about four ounces of the salt per gallon, and works better slightly acid, the tendency in working being toward alkalinity.

The bath should be filtered when freshly prepared, and should be kept in a separate room, or at least away from the apartment in which the buffing or polishing is performed, to avoid contamination by dust as much as possible. Exposed to the air the bath (the water) evaporates, and the water thus lost must be replaced from time to time. To retard this and keep out dust as much as possible, it is well to cover the bath when not in use. Its surface should be skimmed occasionally, and it should be frequently mixed together to preserve a uniform degree of strength.

The tank or vessel in which the bath is contained is usually constructed of smooth two inch white pine stuff, grooved and well bolted together, and coated on the inside with good asphaltum, applied in the melted state.

Instead of this form a clean tub or a half barrel or hogshead, with an extra hoop, may be used, though from the shape of such a vessel there is necessarily much waste space to be filled with useless liquid.

For small baths a neat form of vessel consisting in a square porcelain-lined (enameled) iron tank of suitable dimensions is sold by some of the dealers in electroplating materials.

ANODES OR FEEDING PLATES.

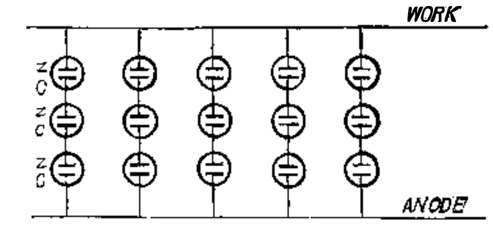
Good pure cast nickel anodes are now obtained at a moderate cost ($1.85 lb.), and are preferable to grain metal anodes. They usually come in sizes ranging from 1¾ x 4 inches, 3/16 inch thick, to 8 x 12 inches, ⅜ inch thick.

They may be suspended around the sides of the tank or across and facing the work (care being taken to avoid bringing them into such close proximity to the work that contact is likely to occur under any circumstance). They may be suspended by clean copper trusses or hooks—which should not be permitted to touch the liquid—from stout copper rods, to which connection with the battery is made.

THE BATTERY.

In nearly all large electroplating establishments some form of dynamo-electric machine is now used instead of the battery. They are cleanly, require little attention and space, and afford a current more easily adapted to the work, and at a much smaller cost.

But as their first cost is considerable, and they require power to operate them, the old battery is still in requisition in smaller establishments. The carbon or chromic acid battery* is more commonly used, as it admits of more rapid work with a smaller number of cells; but as it supplies a very intense current it often becomes necessary to introduce resistance coils to reduce it where small work is on hand. Some of the best work we have ever seen has been produced with the current derived from two or three Smee or sulphate of copper cells (in series). The amount of battery power for a given amount of work should be in zinc surface (exposed) about equal (when in proper working order) to the surface of the work exposed in the plating bath, with care to preserve the tension. If one cell has a zinc surface (exposed), of, say, one hundred square inches, and the work, say, five hundred, the one cell will require to be multiplied by five for quantity and (if the original tension was, say, three) by three to preserve the tension. Thus:



Of course this is equivalent to three large single cells, each exposing five hundred square inches of zinc (equal to a plate about sixteen inches square, exposing both sides). Large batteries of the dipping form, admitting of the immersion of the proper quantity of zinc, are often convenient.

If the current is too strong the deposited metal will present a dull (commonly termed burnt) appearance; if too weak it is apt to be imperfect, granular, or semicrystalline.

For practical purposes the electricity may be said to proceed from the copper or carbon pole of the battery, and care should be taken that this pole is invariably connected (by stout copper wires or rods) with the anodes or feeding plates in the plating bath, for if misconnected damage is done both to the work and the bath by the corrosion or partial solution of the former in the latter.

PREPARING THE WORK.

Before work can be plated its surface must be freed perfectly from all traces of oil or grease, oxides, lacquer, and other impurities. Oil, grease, etc., are removed by contact with a strong, hot aqueous solution of caustic potash, and, after rinsing off the adhering alkali, from oxide by an acid bath; or, if of brass, copper, or German silver, by scouring with fine pumice stone and strong aqueous solution of cyanide of potassium. Iron is pickled in dilute sulphuric or muriatic acid (acid 1, water 5 to 15), and scoured with fine white silicious sand or pumice stone. Brass or copper is sometimes brightened before entering to the plating bath by dipping it momentarily in nitric acid diluted with about twenty parts of water, and quickly rinsing it in running water. It should be placed in circuit immediately after this.

The hand must not come into contact with any part of the work after removal from the alkali, as the slightest touch may spoil all.

On removal of the plated work from the plating bath it should be quickly rinsed (without handling) in cold water, then transferred to hot water, which will cause it when taken out to dry quickly and perfectly. If the finished work is to present a smooth polishing surface it must present such a surface before entering the plating bath. Nickel is hard and will not readily submit to a burnishing tool.

When the work is placed in circuit in the plating bath (and it should not be permitted to remain many moments in the bath without being placed in circuit) it should be moved about to free it from bubbles.

The process of nickel plating is a simple one, and by a little practice and proper attention to the requirements the bath may be worked month after month, and the metal deposited smoothly and with certainty.

* See SCIENTIFIC AMERICAN SUPPLEMENTS, Nos. 157, 158, and 159, for descriptions of batteries.

Paper.—How it is Made.

The antiquity of the paper manufacture is, says the Boston *Journal of Commerce*, probably excelled by but few other products of civilization, Chinese historians carrying it back to a point far in the twilight of our history. In England it was first introduced near the close of the fifteenth century, and in this country in 1693, at Germantown, Pa. The materials from which paper is produced are numerous, but wholly of vegetable origin, neither wool nor hair possessing the capability of being reduced to fibrous pulp, a prerequisite to the formation of paper. Linen and cotton rags, straw, the leaves and stalks of the okra plant, jute stalks, manila, hemp, and even wood fiber, are all used in the manufacture of paper. No substance, however, can equal good linen rags, of which the toughest and finest paper is made. Next in rank are cotton rags, from which the best writing and note paper is made. In this manufacture great care is taken in the selection of the material and in every process.

Gathered from all parts of the country by tin peddlers and by peripatetic ragmen in cities, the rags arrive at the mill in bags, a portion of the stock, perhaps, coming in pressed bales from over the sea. The first process is sorting, and then the rags are cut, usually by girls, by means of a fixed blade in a bench, like a short upturned scythe, the operator picking them up by handfuls and drawing them over the edge of the blade. Each girl is furnished with a sandstone rifle, and when a large roomful of girls are at work the sounds remind one strongly of a gang of mowers at work before the days of the mowing machine. A second sorting, for the removal of all buttons, hooks and eyes, and hard seams, follows, and the rags are then dusted. The duster is a large cylinder, the surface of which is of fine woven wire, inside of which is a shaft carrying arms set around it in a spiral form, and revolving at a higher rate of speed than the cylinder. This difference in speed gives the rags a thorough stirring, while the spiral arrangement of the blades facilitates the exit of the rags, which traverse the cylindrical sieve from end to end. White paper can be made from colored as well as white rags, and for the removal of the color as well as the dirt they are submitted to a boiling with lime water. The