

AMERICAN INDUSTRIES.—No. 31.

THE MANUFACTURE OF SOLID EMERY WHEELS.

The introduction of solid emery wheels has completely revolutionized some branches of industry, not only in the matter of tools and methods employed, but in the economy of production and in improvements in the quality and appearance of articles produced. Every household contains articles which bear evidence of having been improved by the application of solid emery wheels. Take, for example, the various kinds of heaters, stoves, and ranges; their plates are nicely beveled and polished, their doors are well fitted and finished. The almost numberless little implements used in and about the house, the builder's hardware used in the construction of the house, all bear evidences of the utility of the solid emery wheel. There is not a mechanic or artisan that is not in some way benefited by the invention of the solid emery wheel; it cheapens tools, affords a means of sharpening them expeditiously, and in many of its applications supplants lathes, planers, files, and cold chisels, and saves an amount of labor that can scarcely be estimated.

Emery is a granular variety of corundum intimately mixed with hematite or with magnetic iron ore. Corundum is composed almost entirely of alumina, and is closely allied to the ruby and the sapphire; in fact, it is nothing more nor less than an impure variety of sapphire, and if the emery of which the tanite emery wheel is composed, or the wheel itself, be examined with a magnifying glass, the particles will be recognized as sapphire, being as richly blue and translucent as the veritable gem.

The main supply of emery is from Asia Minor, near Ephesus, and the fact that Smyrna is the depot for all the emery obtained in the East gave it the name of Smyrna emery. A great deal of emery is obtained from Naxos and other islands of the Grecian archipelago.

For many years all of the emery rock of the East was taken to England and there manufactured into grains and flour, and was long known under the equally familiar names of "English" and "Smyrna." It is now largely imported into the United States, and the American mills produce crushed, cleaned, and sifted emery equal to the English.

Emery for the manufacture of emery wheels is crushed by rolling or stamping, sifted, and washed. It is in the form of grains, the coarsest being about like split peas, the finest like flour. The several grades of emery are made up into emery wheels by cementing the grains together by some cohesive substance, and pressing the mixture into moulds of suitable form. Shellac and glue were among the first cementitious substances tried, but they were easily affected by heat; the wheels were therefore defective. Various gums and resins have been tried; soluble silicates have been used, and concrete composed of emery and cement has formed the basis of another class of wheels. The important requisite of a good wheel is to combine its elements so that the emery will be thoroughly cemented together with the smallest possible proportion of cohesive substance. In addition to this it must be of uniform density and free from hard or soft spots. It must remain unaffected by the heat generated by its use, and should be free from offensive odors. It should cut freely and rapidly, and not fill up with metallic particles. It should be durable, and above all, it should have sufficient strength to admit of a high velocity without danger of bursting. It is claimed by the Tanite Company that the tanite emery wheel fulfills all these requirements.

Our large front page engraving contains exterior and interior views of the Tanite Company's works at Stroudsburg, Pa.

The tanite solid emery wheels are composed of the purest and best grades of emery and tanite. A portion of the process of manufacture is kept from the public, but enough is revealed to enable us to give the reader a general idea of the mode of manufacture.

Tanite is the invention of T. Dunkin Paret, who has served as President of the Tanite Company for eleven years. The company's motto, "*Ex inutili utilitas*," indicates the utilization of a waste substance.

The crude material from which tanite is made is waste leather scraps, or skivings, as they are called in the trade; the product is a hard, fine-grained, jet-black substance, which may be moulded under a high heat and pressure, and which is capable of receiving a polish equal to that of the best Whitby jet. It was invented as a substitute for vulcanite, and has been used in the manufacture of combs, buttons, jewelry, checkers, dominoes, and a large variety of fancy articles. Its application to the manufacture of solid emery wheels was suggested by Mr. Abijah Wallace, of New York city, an experienced worker in horn, shell, and rubber. Mr. Wallace was, for many years, superintendant for the Tanite Company, and is still a director and stockholder. He recognized the adaptability of tanite to the manufacture of emery wheels, and from that time to this, tanite emery wheels have been slowly improved through a period of thirteen years, until they are now considered as nearly perfect as it is possible to make them.

The factory of the Tanite Company consists of several buildings, spread over considerable ground, and forming the picturesque group shown in the central view in the engraving. The works are situated about two and a half miles from Stroudsburg, Pa., in the town of Monroe, in the middle of a fifty acre farm, through which flows a beautiful stream, the Pocono Creek, furnishing the works with power.

The machinery of the factory is driven by a 42-inch Jonval turbine under a 23½ foot head. In addition to the water

power, the works are provided with a steam engine capable of running all of the machinery. A great deal of space is devoted to the manufacture of a large variety of emery grinding machines. The Tanite Company were the first to combine the manufacture of grinding machines and emery wheels, and have for years been advocating the use of solid emery wheels instead of grindstones and files.

They are noted for their enterprise and energy in adapting their machinery and wheels to the wants of different trades and manufactures, and, notwithstanding the fact that their wheels command a higher price in the market than other goods of the same class, their sales are very large, and the reputation of their goods is as excellent as it is world-wide.

The manufacture of the emery wheel is very simple. The first operation being that of mixing the granulated emery with the tanite. This is done in one of the apartments shown in the upper part of the engraving. The mass of emery and tanite is transferred from this room to the press room, where it is placed in moulds and subjected to strong pressure in the hydraulic presses, while it is at the same time heated by steam passing through the jackets of the moulds.

The last operation in the manufacture of the solid emery wheel is that of turning them perfectly true, by means of diamond turning tools in lathes especially adapted to the purpose, and provided with a hood communicating with an exhaust fan for removing the emery dust. After turning all that remains to be done is to apply the labels and pack the wheels preparatory to shipping.

The Tanite Company have offices and warerooms in Liverpool and London, besides carrying a stock of goods in Boston, Chicago, St. Louis, San Francisco, and in many other of the principal cities and towns in the United States. In Canada and Australia these goods have long been well known.

We are informed that after canvassing the matter thoroughly, the Tanite Company have decided to meet a general demand, by introducing at an early day a low priced wheel, at the same time keeping up the quality of their standard goods.

Liability from Sparks.

Some three months since the *Lumberman*, under the above caption, called the attention of its readers to the fact that improperly guarded smoke stacks were an element of danger not only to the surrounding property, but, as well, to the bank account of their proprietors. We at that time, says the above paper, cited the case of McLaren *versus* the Canadian Central Railway as an instance in point. The mills of the plaintiff at Carlton Place, Ont., together with the mill yards, were destroyed by fire caused by sparks from a locomotive belonging to defendants, which, in passing the yards, emitted sparks which were seen to fall and ignite the lumber, and damages to the amount of \$140,000 resulted. Upon suit being instituted in the Court of Queen's Bench, a jury rendered a verdict for \$212,000, which being largely in excess of the damages claimed by Mr. McLaren, a new trial was granted, which, on change of venue asked by the railway company, has just taken place at Toronto, and damages awarded to the plaintiff of \$100,000. The telegraph announcement of the verdict also stated that the case would be appealed, but it was not stated whether by Mr. McLaren upon the ground of insufficiency of the amount, or by the railroad company. Be this as it may, it is another strong assertion of the law that no man has a right to improperly expose his neighbor's property to destruction. The defense of the railroad was mainly upon the point that ordinary care had been taken to provide sufficient spark catchers to the engine, and that they had done all that they could reasonably be expected to do to avert such calamities. The decision indorses the old-time notion that it is not enough to hope that our neighbor will not be injured by us; we must be sure of the fact, and will be liable for all damage resulting from our neglect. Mill men would, in the light of this decision, do well to so arrange their stacks and chimneys that they will not be open to the liability resulting from damage to their own or their neighbors' property. We append the questions submitted by the learned judge for the consideration of the jury, from which our readers will gather an idea of the points upon which the case hinged. We also append the following extract from the charge of Justice Williams, at Buckingham, England, in a case against the London and Northwestern railroad involving the same points, in which the learned judge said:

"It remains to consider what is to be regarded as negligence on the part of the company for the consequences of which they are to be held responsible. The company, in the construction of their engines, are not only bound to employ due care and all due skill for the prevention of mischief accruing to the property of others by the emission of sparks or from any other cause, but they are bound to avail themselves of all the discoveries which science has put within their reach for that purpose, provided they are such as under the circumstances it is reasonable to require the company to adopt."

The questions submitted to the jury in the McLaren case were as follows:

1. How did the fire occur? Was it from sparks or cinders from the locomotive, or some other cause?
2. If you find the fire was caused by this locomotive, did it come from the smoke stack or ash pan?
3. If you find that it came from the smoke stack, was it from any imperfection in the construction of the stack, or from the manner in which it was managed by those in charge of the train?

4. If you find it was from any imperfection of construction, state what the imperfection was.

5. Was the netting too large, or was the bonnet improperly fastened?

6. If you find it was from improper or careless management of the smoke stack, what was the act done imputing to the defendant such improper carelessness?

7. If you find the ash pan or damper were not properly managed, in what respect were they improperly managed?

8. Was the mesh on the bonnet of engine No. 5 composed of a larger size than that used by the Great Western or Northern railway?

9. Were the defendants guilty of neglect in using such a mesh?

10. Was the plaintiff guilty of contributory negligence in piling his lumber so near the track, leaving the shavings about and not having sufficient appliances to extinguish fires?

The jury then retired at four o'clock, and returned at twenty minutes to seven o'clock with a verdict for plaintiff—damages \$100,000.

Tea Taster's Occupation.

Dr. C. L. Dana, in an article in the *Medical Record* on tea tasting by brokers and dealers in teas, maintains that it is a healthful occupation, which is not in accordance with the conceived opinion of other writers on the subject. In support of his assertion Dr. Dana reports cases of living men far advanced in life who have followed the business of tea tasting for periods ranging from thirty to forty years without injury to their health. But whether the writer's conclusions are correct or otherwise, the life of a tea taster is a curious one, and the process of examining and deciding upon the qualities of the article is one not generally known.

There are, says Dr. Dana, probably more than a hundred firms engaged in tea tasting in this city. In all of their offices there are large tables with round, revolving tops. A circle of teacups is placed along the edge of these. The tea taster sits down before the display of crockery, and tastes one cup after another, moving the table-top around. In the center of the table is a pair of scales with a silver half dime in one of the balances. One or two large kettles are kept constantly with boiling water in them. When a sample of tea is to be tasted, as much is weighed out as will balance the half dime. This is put in a teacup and the boiling water poured on. The tea taster then stirs up the leaves, lifts them on his spoon, and inhales the aroma. At the same time he generally takes a sip of the infusion, holds it in his mouth for a short time, and then spits it out. Enormous brass cuspadores, holding two or three gallons, receive the tea thus tasted and the contents of the cups that have been examined. On some occasions, when a large amount of tea of a certain kind is to be bought, many samples of this are brought in from different houses. The buyers and sellers sit around the revolving table with the samples made into infusions in the cups before them. These are tasted all around, the "body," fineness, "toastiness," etc., are learnedly discussed, and the poorer specimens discarded. Then those that are left are tasted again and the number further reduced. So it goes on until the article which unites the desired quality and price is obtained.

The skill displayed at these "drawings" is quite remarkable. A tea taster will detect not only the quality of a tea as regards age, strength, flavor, fineness, etc., but he can tell in which of the numerous districts in China the tea was grown. The facts regarding the different samples are sometimes put on the bottom of the cups, where they cannot be seen. The cups are then mixed up, and the infusions tasted again and sorted out simply by their flavors.

A great deal of tea may be tasted before these tea drawings are finished. It is hard to tell the amount that a tea taster takes during a day, for it varies a great deal with the activity of business. Few of the gentlemen whom I asked could give any idea. Sometimes, however, as many as four or five hundred cups are tasted in the day. It is quite the custom to have to be tasting tea steadily for the most of the day, or for hours at a time. Probably an average of two hundred cups a day throughout the year is a low estimate. The poorer kinds of tea are often not sipped at all. But the sense of smell is depended on. Of the better qualities of tea, some is swallowed, and some spit out. Indeed, whenever the tea is taken into the mouth a little of it is swallowed. The tea gets into the system, therefore, in three ways: by inhalation, by absorption through the oral mucous membrane, and by the stomach. More tea is simply taken into the mouth without swallowing than is inhaled alone; but all the tea is inhaled, even if it is tasted also. It is only a small proportion, amounting to not more than two or three cups a day, that is swallowed. A silver five cent piece weighs 1.18 grms. (gr. xviii.) Estimating that an average of two hundred cups of tea are tasted per day, about one-half of a pound would represent the whole amount used.

Japan tea has of late years become by far the most popular variety, and more of it is imported than of all other kinds together. Green tea, on the other hand, is much less extensively used than formerly.

A SOUND and liberal education is the surest pathway to success in all pursuits. Statistics show that the educated man will, on the average, be as far advanced in his career at thirty-five years of age as the uneducated at forty-five or even fifty. Not one out of every ten of uneducated men achieves success.—*J. M. Gregory, Champaign, Ill.*

SCIENTIFIC AMERICAN

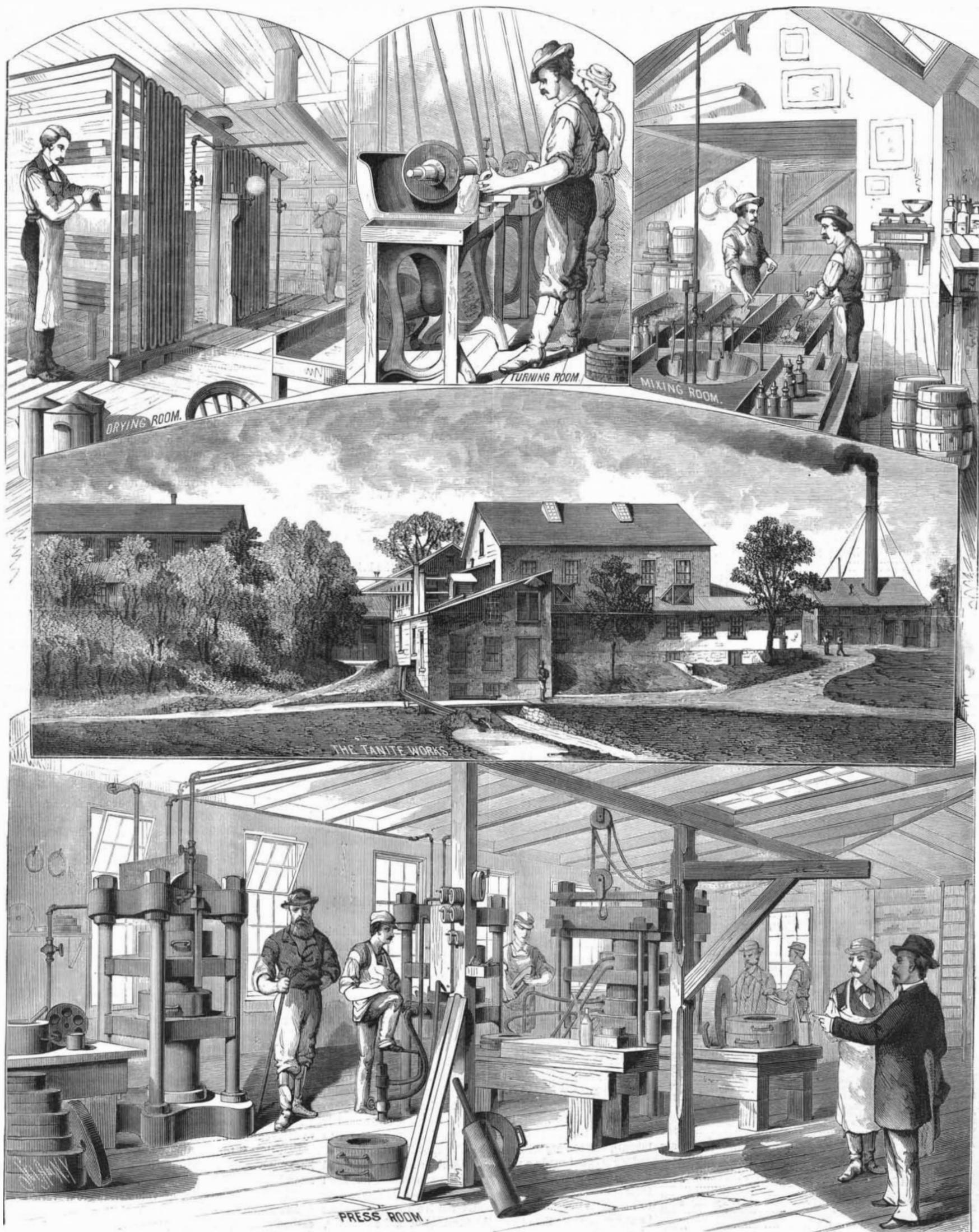
[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. XLII.—No. 8.
[NEW SERIES.]

NEW YORK, FEBRUARY 21, 1880.

[\$3.20 per Annum.
[POSTAGE PREPAID.]



THE MANUFACTURE OF SOLID EMERY WHEELS.—WORKS OF THE TANITE COMPANY, STROUDSBURG, PA.—[See page 117.]