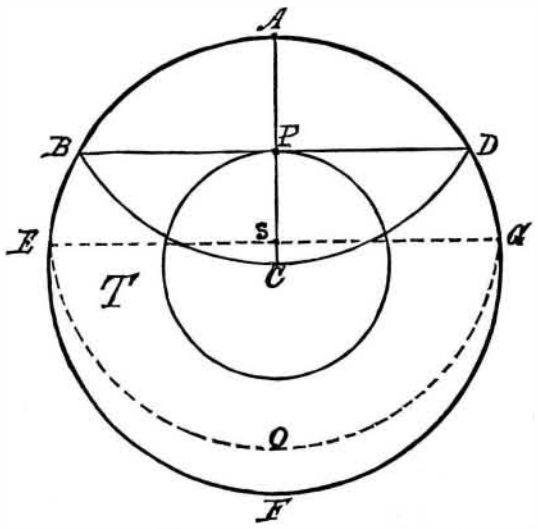
Correspondence.

Weight On and In the Earth.

To the Editor of the Scientific American:

Mr. E. B. Whitmore (page 84, current volume) denounces the ordinarily received "body in a hollow sphere doctrine" as unmistakably absurd and false. The doctrine positively declared to be false is the well known and entirely proved theorem that a hollow shell, of equally distributed matter, attracts a body placed inside of it equally in all directions. That is, a body at any depth in the earth is attracted effectively by that part only of the earth that is below that depth, the shell of matter outside of that having an equal effect in all directions, and thus no effect.



In connection with this theorem and following from it is the theorem that "a body lowered towards the center of the earth would lose in weight in proportion to its distance downward." But Mr W. says these two theorems are contradictory to each other, and illustrates by supposing a body to weigh, say, 24 lbs. at the surface of the earth, and to be lowered half way to the center. Then, he says, according to the hollow sphere doctrine, it will weigh only 3 lbs., because only one eighth of the earth's volume is nearer than the body to the earth's center; whereas, according to the other theorem, it must weigh 12 lbs., this being proportionate to the distance. But in this reckoning Mr. W. very carelessly ignores the fact that attraction is always inversely proportional to the squares of the distances from the attracting body. If the body weighing 24 lbs. is carried half way to the center of the earth, it must therefore weigh four times 24 lbs., that is 96 lbs., there, if still attracted by the whole body of the earth towards the center. But, in fact, it is attracted by only one eighth part of the earth's body, and will therefore weigh only one eighth part of 96 lbs., that is 12 lbs. And at all distances, the attraction within the earth's body, assuming the body to be of uniform density, being directly as the cubes of the distances from the center (the result of leaving out the external shell entirely, as ineffectual) and being also inversely as the squares of the distances, in consequence of the mere fact of distance, the result is that the actual effective attraction must be directly as the distances.

Another objection to the hollow sphere theorem, stated by Mr. W., is that it would follow from it that a hollow sphere would balance, as on its center of gravity, if supported at any point inside of it: whereas it will not balance unless supported at the center. Here, again, he ignores the effect of distance on the force of attraction. A hollow sphere does balance around any and every point within it, as far as the mutual attraction of its own parts towards each other is concerned. But the balancing of attraction from some other distant body, as in the case of all weights on the earth's surface, is quite another thing. J. P. PERRY.

New Ipswich, N. H.

Weight On and In the Earth.

To the Editor of the Scientific American:

Your correspondent, Mr. E. B. Whitmore (see page 64, current volume), should be more careful in pronouncing absurd a well established theorem, simply because he cannot look through it at the first glance; and he makes a serious mistake in his own conclusions. He omits to observe that the distance of P from C is equal to ½ that of A from C, and that, in order to get the attraction of the original 24 lbs. when removed to P, he should multiply the 3 lbs. of his calculation by the square of 2, and he would have found no hostilities between the old theories. His considerations, however, show the well known fact that an object at P is attracted equally strongly by the small sphere and by the lenticular mass, BFDC. HUGO BILGRAM.

Philadelphia, Pa.

Electricity and the Radiometer.

To the Editor of the Scientific American:

I have recently observed a phenomenon which is calculated to throw some light on the theory of that mysterious little instrument, Crookes' radiometer; and as, to the best of my knowledge, it has not been noticed before, I hasten to communicate it to the readers of the SCIENTIFIC AMERICAN. The radiometer used was one made by Geissler, of Bonn, and is in all respects similar to that described in the SCIENTIFIC AMERICAN, Vol. XXXII, page 392. The phenomenon and the method of observing it are as follows:

1. The glass globe of the radiometer becomes negatively electrified upon the whole of its outer surface when submitted to the radiation of the sun or any source of light, or even to obscure heat radiations of a certain intensity.

2. The presence of electricity is more sensible upon the hemisphere facing the source of radiation than the farthest removed from it.

The presence of this free electricity was determined by means of a proof plane and a Böhnenberger's electroscope, and is so easily verified that anyone possessing an electroscope of this description can verify the above statements for himself. There is no need of using a condenser, as the effects are sufficiently apparent without it. By placing the radiometer near a luminous or obscure source of radiation, and simply touching the globe, several times and in different places, with a piece of tinfoil supported on an insulated handle, and then approaching the tinfoil to the electroscope, a marked deflection of the gold leaf towards the negative pole is at once observed. If the same experiment be repeated with the radiometer when removed from the radiant source and placed in obscurity, the globe gives no signs whatever of electricity.

This manifestation of electricity cannot be attributed to the friction of the vanes of the radiometer with the rarefied air of the globe. For if the radiometer be inverted so that the vanes cannot rotate, and be then exposed to the radiant source, the same electrical effects will be produced. Several experiments, too simple to be repeated here and which, moreover, each observer will easily imagine for himself, have also convinced me that these effects cannot be attributed to a feeble evaporation on the exterior of the radiometer.

By attaching pieces of tinfoil to the electrodes and applying them to the globe of the radiometer, I have also determined that this instrument is sufficiently delicate to indicate, by a marked fluctuation. the feeble tension of a quart cell of Grenet's bichromate battery. I hope, however, to be able to give more details of this experiment in a future communication.

As your readers will observe, I have not stated to what molecular changes I believe these electrical manifestations are due. Still less do I hazard any opinion in regard to the theory which presents itself quite naturally on the mere statement of the above facts, and which seems to explain all results observed with the radiometer up to the present. This I hope to be able to do in a short time.

JOSEPH DELSAUX, S. J.,
11 Rue des Recollets, Louvain, Belgium. July 14, 1876.

Are Potato Bugs Poisonous?

To the Editor of the Scientific American:

I notice that the last issue of the SCIENTIFIC AMERICAN, in speaking of potato bugs, says that they are not poisonous. This statement ought to be taken with some qualification, I think. We have had ten years of experience with the insects in this State, and the universal impression here is that it is not safe to handle them. I have known of numerous instances wherein people have been made seriously sick by breathing the fumes where potato bugs had been thrown into the fire, or where boiling water had been poured on them to kill them. I also knew the case of a Bohemian woman who killed the bugs with her hands: and as the skin was broken slightly on one finger, an inflammation set in, which resulted in her death. Other instances might be given, equally conclusive in their bearing on the point in question. I think there can be no doubt that there is a poisonous principle in the bugs, which renders them dangerous to life and health if carelessly handled.

They can be destroyed by sifting a mixture, of 1 part pure Paris green and 20 parts of flour or ashes, on the vines when they are damp. But a better way is to put a teaspoonful of Paris green into a pailful of water, mix thoroughly, and sprinkle it on the vines. This can be done at any time of day, and there is no danger of the poison being blown into the face or eyes of the person applying it. WISCONSIN.

"POTATO PEST POISON."

BY CHARLES V. RILEY.

Several persons have recently written to get my opinion of a purported new remedy for the Colorado potato beetle, extensively advertised under the above name by the Kearney Chemical Works, 66 Cortland street, New York city. I should, on general principles, dissuade any one from purchasing a secret remedy, when a cheap, simple, and effective one is well known. Yet as there is always room for improvement, and the inventor and discoverer of something valuable has a right to profit by his discovery if he can, I am just as ready to commend as to condemn any insect remedy offered to the public, according as it merits condemnation or approval, desiring to do justice to the rights of the individual as well as of the public. What, then, is this *new* "Pest Poison," and does it represent some valuable discovery which deserves to be kept a trade secret? Or is it simply one of the many secret nostrums constantly offered to the farmer by schemers who desire to fill their own pockets? Let a candid consideration of the matter decide.

The circular of the firm claims that this "pest poison" is manufactured on "strictly scientific principles," and that it is "the only safe, sure, and cheap destroyer of potato and tomato bugs, chinch bugs, cut worms, wire worms, and army worms, caterpillars, and all insects which prey upon vegetation"! Whenever men are found making the ridiculous claim, for any substance whatever, that it is a universal cure for all noxious insects, it is safe to set them down as ignoramuses or charlatans. The habits and modes of life of insects are so varied that what may prove a perfectly satisfactory remedy against one species is often utterly worthless against another; while for successful warfare, special tactics are required in almost every case. The circular further unqualifiedly claims on one page that the poison "is not injurious to vegetation, while admitting in a special notice on another page that, if used too strong or too frequently, it injures vegetation. The truth is that many tender plants are injured by it even when used as recommended, while even stout-leaved evergreens are seriously injured when the strength of the solution is doubled. In the "directions for use" we find brief accounts of various insects, which show on their face that the authors of the circular and agents for the poison know nothing about the insects they speak of, and recommend their poison for species upon which it has never been tried. The directions under the head "Army Worm" may be taken as a sample. The passage, with the exception of the first and last sentences, is taken almost word for word, without credit, from an article of mine (New York *Tribune*, November 16, 1875); and in the sentences excepted, we are told that the army worm belongs to the "order of *noctua*!" (*noctua* is an old genus of the order *lepidoptera*), and that for this insect the solution must be made of double strength, whereas, thus made, it will injure most grasses.

The special notice closes with the following paragraph:

Furthermore, lest a prejudice should be founded on the fears of some people that the vines or crops will absorb the the poison, we have before us detailed experiments for several years past, showing that not a trace of this poison has ever been found in potatoes or grain which have been watered with this solution in much greater quantities than was necessary to destroy worms or insects, and the opinion, also, of eminent chemists, that once in the ground the poison is completely neutralized.

Here again the circular misleads, and I very much doubt whether there is a particle of truth in the statement as to the years of experience or the opinions of eminent chemists. Such language would hold true of the Paris green mixture, but not of the poison advertised. This, upon analysis, proves to be a mixture of arsenate of sodium and common salt, faintly colored with rosaniline; and as opposed to the opinions of the unnamed "eminent chemists" of the circular, I will quote the opinions of Professor Wm. K. Kedzie, of the Kansas State Agricultural College, who says that "the great objection to the use of these compounds is their extreme solubility in water. They are offered to the plant in perfect condition for absorption into its circulation; and while, in the case of Paris green, the minute proportion dissolved is at once rendered inert by the hydrated oxide of iron in the soil, it is by no means certain that the proportion of the latter is in every case sufficient to accomplish this when the arsenic compound is applied in such large quantity and in complete solution."

Last year, in my eighth report, I had something to say of a "Potato Pest Poison," manufactured by the Lodi Chemical Works of Lodi, N. J., showing that it did not work as effectually as the Paris green mixture, and that there could be no advantage to the farmer in its employment. Experiments which I have recently made show that the Kearney pest poison acts very much like its Lodi prototype, the only advantage over which it can claim being the faint coloring. The Lodi company sold a 1 lb. package for $1, which was to be dissolved in 120 gallons of water or more. The Kearney company sell a half pound package for 50 cents, which is to be dissolved in 60 gallons. Of cour e either company could get any number of testimonials as to the efficiency of their compounds. They herewith have mine. To put forth the false claim of the circular I have noticed, is simple humbug. There are plenty of farmers, gentlemen, who, rather than go to the trouble of making their own mixtures, will send for your poison packages, when they once know what your mixture is, where they would not think of ordering a secret remedy. Do not sail under false colors, or claim more than your mixture deserves: let people know that there is just as much danger, if not more, in its use, as there is in the use of Paris green in the wet method. Do this, and put your article up in more secure packages, so that the poison in deliquescing does not soak and drip through in hot weather as it now does; and I believe you will still do a good business, and deserve *not* to be ranked as charlatans.

Burns and Scalds.

The recent fearful explosion on board the British ironclad Thunderer has called out the publication of many recipes and remedies. Among them all, the following, contributed by an old and experienced physician, has the merit of convenience and readiness. The remedy is simply this: The common whiting of commerce (found in nearly every kitchen), reduced by cold water to the consistence of thick cream, is to be spread on a light linen rag, and the whole burnt surface instantly covered, and thus excluded from the action of the air. The ease it affords is instantaneous, and it only requires to be kept moist by subsequent occasional sprinklings of cold water.

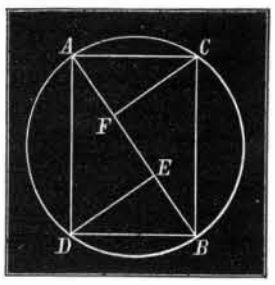
Birds' Tracks in Stone.

Professor Marsh, of Yale College, is paying Dr. Field, of Franklin county, Mass., $100 a year for the right of quarrying slabs of stone showing foot prints of birds. A basket full of specimens, worth $200, was recently taken out. The specimnes are well washed, and then coated with shellac.

AMONG the new arrivals at the Central Park menagerie are two little leopards, born a week ago. They are about as large as half grown kittens and twice as clumsy. The hair is bluish gray instead of tawny yellow, as in the adults; but the black spots are well defined. In a few days they will be exposed to view.

Facts and Simple Formulæ for Mechanics, Farmers, and Engineers.

The present is the best time for felling trees. For the purpose of seasoning, timber should be piled under shelter and kept dry: it should have a free circulation of air about it without being exposed to strong currents. The bottom pieces should be placed upon skids, which should be free from decay, and raised not less than two feet from the ground. A space of an inch should intervene between the pieces of the same horizontal layers, and slats or piling strips should be placed between each layer, one near each end of the pile and others at short distances, in order to keep the timber from winding. The strips should be laid one over the other, and in large piles should not be less than 1 inch thick. Each pile should contain but one kind of timber, the heavy sticks being below and the light ones on top: and the piles should be 2½ feet apart.



To cut the best beam from a log, divide the diameter, *ab*, into 3 equal parts, *af*, *fe*, and *eb*; and from *e* and *f*, draw the lines *fc*, *ed*, at right angles to *ab*. Join *ac*, *rd*, *bc*, and *bd*; then *abcd* is the cross section of the strongest beam.

To find the weight in pounds of metal objects, measure the number of cubic inches contained in the piece for wrought iron by 0·2816; cast iron 0·2607; copper, 0·32418; lead, 0·41015; brass, 0·3112.

To find the diameter of wrought iron shafting in inches to transmit a given power, multiply the indicated horse power by 65, divide by the number of revolutions per minute, and extract the cube root of the quotient: for crank shafts and prime movers, substitute 83 for 65.

In the drainage of land, the following depths and distances should be observed:

Soil.	Depth of pipes. feet	inches	Distance apart. feet.
Stiff clay	2	6	15
Friable "	2	0	18
Soft "	2	9	21
Loam with clay	3	2	21
" " gravel	3	3	27
Light loam	3	6	33
Sandy "	3	9	40
Light sand with gravel	4	0	50
Coarse gravelly sand	3	6	60

In corn mills, for each pair of stones, with all the necessary dressing machinery, etc., about 4 horse power nominal may be allowed. One pair of 4 feet stones will grind about 5 bushels of wheat per hour. Each bushel of wheat so ground per hour requires 1·11 horse power (indicated), exclusive of dressing and other machinery. Speeds in corn mills are as follows: Stones 4 feet diameter, 140 revolutions per minute; dressing machines 21 inches diameter, 450 to 500 revolutions per minute; creepers with 3½ pitch, 75 revolutions per minute. Elevator with 18 inches diameter, 40 revolutions per minute; wheat screen, 18 inches diameter, 300 to 350 revolutions per minute.

An average of 27 kinds of coal has given about 40½ cubic feet per tun.

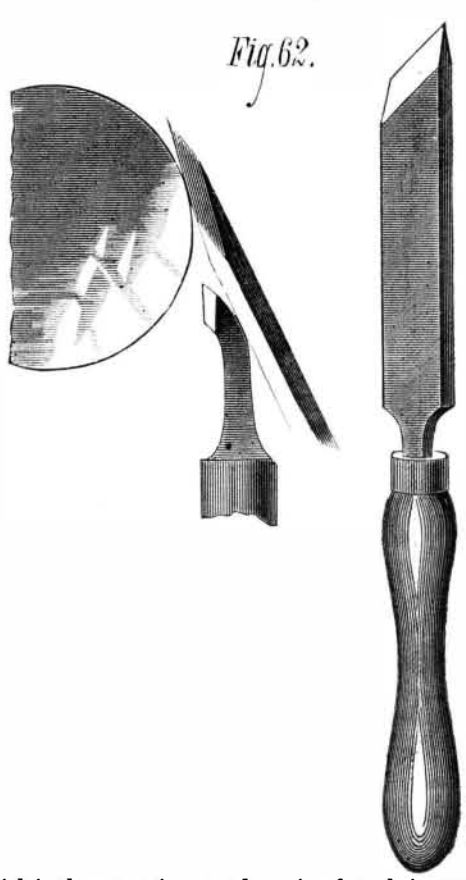
PRACTICAL MECHANISM.

BY JOSHUA ROSE.

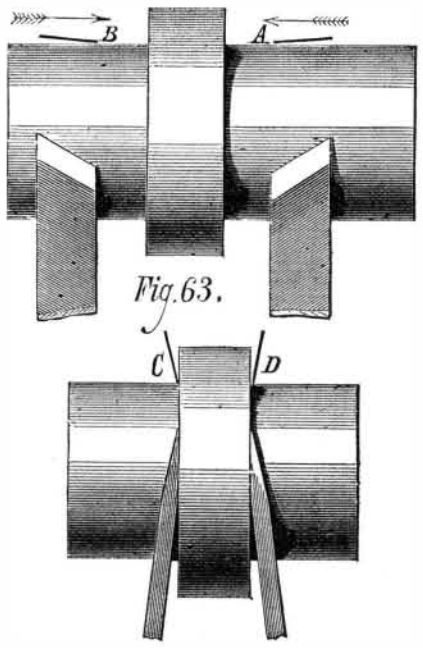
SECOND SERIES—Number IX.

PATTERN MAKING—TURNING TOOLS.

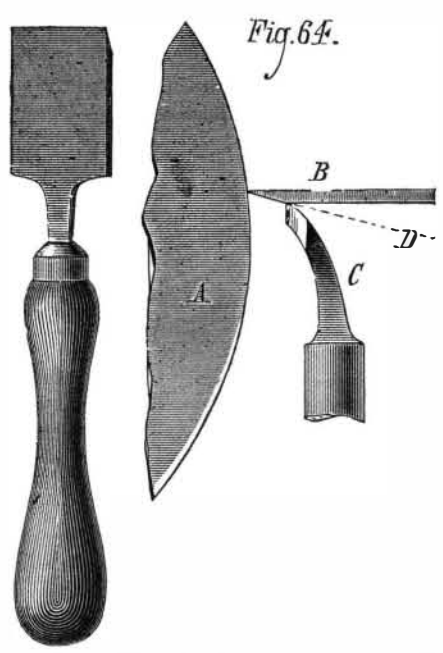
For finishing plain work, we have the tool shown in Fig.



62, which is the exception noted previously as being a finishing and, at the same time, a cutting tool. It is called a skew chisel, because its cutting edge is ground at an angle or askew to the center line of its length. Furthermore, it is beveled at the cutting end on both sides (as shown in the edge view), being ground very keen. It is employed for finishing straight or parallel surfaces and for dressing down the ends or down the sides of a collar or shoulder. When used for finishing straight or parallel surfaces, it performs its cutting in the center of the length of its cutting edge only, as shown at A, in Fig. 63, and is held in the position relative to the work shown in Fig. 62. When nicely sharpened it leaves a polish, unlike other finishing tools; but with these advantages, it has a drawback (and a serious one) to learners, as it seems to have a terrible propensity for tearing into the work, whether it is used upon the circumference or facing the shoulders of the work. This difficulty can only be overcome by practice, and the reason lies in the difficulty of learning how to handle the tool with dexterity. It must be held almost flat to the work; and yet, if it should get quite flat against the work, the cutting edge would cut along its whole length, and the pressure of the cut would be sufficient to force the tool edge deeper into the work than is intended, which process would continue, causing the tool to rip in and spoil the work. The face of the chisel nearest to the face of the work being operated upon stands almost parallel, with just sufficient tilt of the tool to let the cutting edge meet the work in advance of the inside face of the tool; or in other words, the amount of the tilt should be about that of the intended depth of the cut; so that, when the cutting edge of the tool has entered the wood to the requisite depth, the flat face will bear against the work and form a guide to the cutting edge. The corner of the chisel which is not cutting must be kept clear of the work. Fig. 63 will convey the idea, the arrows showing the direction in which the chisel is, in each case, supposed to be traveling.



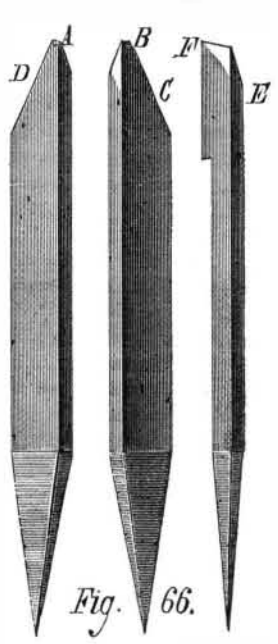
The short lines, A and B, under the arrows, and those touching the collar, at C and D, show the tilt or incline of the chisel to the work. In turning the circumference, the obtuse corner of the chisel is the cutting one; while in turning down, a side face it is the acute angle. Most pattern makers, however, do not often use the skew chisel for finishing straight cylindrical work, because it is liable to make the surface of the work more or less wavy. It is, however, almost always used for cutting off and for cutting down shoulders, for which purpose it is highly advantageous. For circumferential work on cylindrical surfaces, an ordinary chisel is mostly employed, the position in which it is held to the work causing it to scrape rather than cut. A worn out paring chisel is as good as any, but in any event it should be a short one. Such a chisel is shown in Fig. 64, the position in which it is held being illustrated by A, which represents a section of a piece of cylindrical work, B representing the chisel, and C the hand rest. Some pattern makers prefer to increase the keenness of this tool by holding it so that the plane of its length lies in the direction denoted by the dotted line, D; this, however, renders it more likely to rip into the work, and the position shown is all that is necessary, providing the cutting edge be kept properly sharpened. This chisel is also used on side faces.



Still another tool, sometimes used for finishing plain cylindrical surfaces and side faces, is that shown in Fig. 65 at A. It is used in the same manner and relative position as the chisel shown above, in Fig. 64.

For finishing hollows, which should first be roughed out with the gouge, the form of tool shown at B, in Fig. 65, should be used. Several of these tools, of various sizes, should be kept; they are used in the same position as the finishing chisel shown in Fig. 64. The tool shown at C, in Fig. 65, is used upon large work, and is advantageous because it presents less surface of cutting edge in proportion to the depth of the cut than does the gouge; and, in consequence, it is less liable to cause the work to jar or tremble. It is usually made about 2 feet long, which enables the operator to hold it very firmly and steadily. It is used with its top face lying horizontally, and should be kept keen. D, in the same figure, represents a similar tool, with a round nose; this latter is not, however, made long, and may be used in a handle.

For boring purposes, the tools shown in Fig. 66 are employed; those shown at A and B, having their cutting edges at C and D, are therefore right and left hand tools. When, however, the hole is too small to admit of those tools being used, that shown at E may be employed, its cutting edge being on its end, at F.



The temper of all these tools should be drawn to a light brown color, and the instruction given for grinding bench tools should be rigidly observed in grinding and oilstoning these turning tools.

A Remarkable Dwarf.

Several medical men, including Drs. Alexander Mott, J. L. Little, J. M. Merrill, E. Hudson, and S. Roof, lately visited by invitation the Mexican dwarf, Lucia Zarate, at Tony Pastor's theater in this city. These visitors said she seemed perfect in structure, healthy, and intelligent. She understands and talks Spanish and a few words of English. She is getting her second teeth; and although the doctors could not tell whether or not she was 12 years old, as claimed, they said she had teeth which she could not have under 6 years of age. She ran about, shook hands with, and talked a little to those present. She is now smaller than are many infants at the time of their birth. The following measurements were taken: Hight with shoes on, 21½ inches; length of leg from hip, 10½ inches; around head, 13 inches; circumference of thigh, 4¾ inches; circumference of calf of leg, 4 inches (one inch more than a man's thumb); length of shoe, 3 inches; width of shoe, 1⅛ inches. The parents of the child are with her, and are of the usual size; the mother is about the medium hight, the father, 5 feet 5 or 6 inches in hight, and quite fleshy.

THE latest improvement in mills for grinding wheat, etc., consists in the use of porcelain rollers for crushing the wheat previous to submitting it to the millstones. The result is an improvement in the quality of the flour, and a larger yield in a given time.

DETECTION OF FUCHSIN ADULTERATION IN WINE.—According to M. Jacquemin, natural red wine does not stain wool, the material regaining its white color after washing. If fuchsin be used to color the wine, however, the wool remains tinged with red.