not only invented, but, still better, well-tested by ample experience. I mean, of course, the "reform dress," or "Bloomer," as it is generally mis-named. Perfection is not claimed for it, although, compared with the body-crushing costume now in fashion, it almost does seem like perfection. It is not necessary for inventors and artists to exercise their powers on a new dress for working females; but it *is* necessary for the millions of working females to take courage enough to adopt a dress that is already waiting for them, and for the millions of short-sighted men to sustain them in this course. So besotted is the prevailing taste for "Paris fashions" that, if the wisdom of a Newton and the ideality of a Raphael were strained to the utmost to devise a good and beautiful apparel for women, it would be rejected for the last whim of the Empress Eugenie! This matter is particularly appropriate for the columns of the SCIENTIFIC AMERICAN, which is pre-eminently the industrial paper of the country; and what more nearly concerns the industry of about one-half its inhabitants than the question of a good *working-dress for women?* E. M. RICHARDS.

Moore's Ordinary, Va., May 14, 1860.

IMPROVING FARMS WITHOUT MANURE.

We request the attention of our farmers and all others interested in agriculture to the following letter:—

MESSRS. EDITORS:—Although our opinions are so widely different on the principle which governs the vegetable kingdom, yet there is one point on which we perfectly agree, namely, the subject is one of great importance to our people. But when you say that every bushel of wheat or other crop taken from the soil is required to be returned again, in constituents, in some form or other, under penalty of barrenness, our opinions again widely differ. You say that this fact is now universally recognized. This is proof to me that your knowledge of the views of those who cultivate the soil is very limited indeed. A very large majority of the farmers with whom I converse, express reverse opinions. They assert that if the constituents which are taken off the soil had to be returned, they would give up farming in despair, because it would be impossible for them to do so. I read your article on agricultural science to my next neighbor, and asked him how much he returned to the soil annually. He replied, that for thirty years he had taken a large amount of hay, straw, grain and roots, and sold them in the market, for which not a particle had been returned to the soil, and yet his farm had greatly improved during that time. Nine out of ten of the farmers with whom I have conversed and to whom I have put this same question, have testified in the same manner. G. B.

Bethelhem, N. Y., April 28th, 1850.

The constituents of the soil for raising crops mean those manures called "fertilizers." If our correspondent and his neighbors have cultivated their farms for a number of years without manuring them, and have taken several crops from them during those periods, and at the same time have greatly improved their land, then they have discovered the "philosopher's stone," and we recommend their appointment as professors in all our agricultural colleges and schools. We assert without fear of successful contradiction, that every crop taken from the soil requires to be restored again in constituents in some form, under the penalty of future barrenness. We know that on the rich river-bottoms of the West the soil is very deep, and it will take many years to exhaust it, but thousands of farms have become barren in this new country on account of not restoring the constituents of crops regularly to the soil. We know something about farming practically, but have not learned in the same school as our correspondent and his neighbors. If he is right, what a lot of fools must those farmers be who spend money for guano, superphosphates poudrettes and other fertilizers. If one man can improve his farm and take crops from it regularly for thirty years without manuring, so can all farmers—if they know how. We trust our correspondent will communicate the method by which this is done, as it is of great consequence to the whole world.—EDS.

MORIN ON "FRICTION."

The very important subject of friction has been more thoroughly investigated probably by Arthur Morin than it ever was by any one else. His experiments were made at Metz in 1831, '32, '33 and '34, and were published in *Recueil des Savans E'trangers*, tomes IV. and V. The general results are stated in his work on "Mechanics," recently translated by Joseph Bennett, and published by D. Appleton & Co., of this city. As some of our readers may not have met with an account of these most valuable experiments, we present a very brief abstract of the most interesting results.

The three principal laws which Morin established in regard to the friction of plane surfaces rubbing on each other are these:—1st, The friction is proportional to the pressure; 2d, It is independent of the area of the surfaces of contact; 3d, It is independent of the velocity of motion.

A weight was placed upon a plane and drawn along by a cord passing over a pulley with a weight suspended at its end. The power required to bend the cord, the friction of the pulley, and all other modifying elements were measured and taken out of the problem; so that the figures show the number of pounds required to overcome simply the friction of one surface rubbing on another under different degrees of pressure, with different materials, and with several lubricating circumstances. For example, cast iron resting upon cast iron, without any lubricator, and pressed down with a weight of 496.1 lbs.; it required 64½ lbs. hanging perpendicularly to overcome the friction in drawing the upper piece of iron along; and the ration of 64½ to 496.1 is 13-100, or expressed decimally, it is in proportion of 0.13 to 1. In other words, it requires 13-100 of a pound suspended vertically to overcome the friction of one pound of dry cast iron resting upon a plane cast iron bed.

Cast Iron upon Cast Iron.

Area of sur- in contact in sq. feet.	Lubricator.	Pressure. lbs.	Friction. lbs.	Ratio of friction to pressure.
0.3874	Nothing	496.1	64.5	0.130
"	"	1091.1	211.1	0.193
"	"	4412.7	681.7	0.154
			Mean	0.154
0.3874	Water	1104.3	312.3	0.282
	"	2202.7	731.3	0.332
			Mean	0.311
0.3874	Lard	1103.4	72.9	0.070
Strong Leather—tanned and placed flatwise upon Cast Iron.				
0.4155	Nothing	471.0	272.7	0.579
"	Oil	1114.1	140.9	0.126
Brass upon Oak—without unguent; the fibers of the wood being parallel to the direction of motion.				
0.141	Nothing	248.3	153.6	0.616
Oak upon Oak—the fibers of the wood being parallel to the direction of motion.				
2.798	Nothing	2291.5	1080.6	0.471
1.062	"	102.1	50.8	0.498
0.33	"	604.0	293.5	0.484
Elm upon Oak—the fibers of the wood being parallel to the direction of motion.				
1.338	Nothing	260.0	117.2	0,45
"	"	1980.1	821.7	0.42

From the above table it will be seen that, when cast iron is rubbing upon cast iron with the bearings dry, the friction is doubled by wetting the bearings with water, while it is reduced more than half by lubricating with lard. The friction of brass rubbing upon oak is about nine times that of lubricated cast iron upon cast iron, being considerably more than the friction of oak upon oak.

The following table exhibits the ratio of the friction to the pressure for various substances rubbing together with the same lubricating material. In these experiments, the substances, after having been smeared with an unguent, were wiped, so that no interposing layer of the unguent prevented their intimate contact. In all cases in which woods were tried, the fibers were parallel to the direction of motion:—

Copper upon oak	0.100	Elm upon elm	0.140
Brass upon cast iron	0.107	Cast iron upon wrought	0.143
Cast iron upon oak	0.107	Cast iron upon cast iron	0.144
Oak upon oak	0.108	Wrought iron upon brass	0.160
Yellow copper upon cast iron	0.115	Wrought iron upon wrought	0.177
Elm upon oak	0.119	Leather upon brass, wetted	0.244
Brass upon brass	0.134	Leather upon cast iron, wetted	0.229
Elm upon cast iron	0.135	Beech upon oak	0.330
Wrought iron upon elm	0.138		

Morin says that the three laws of friction above stated were proved by all the experiments in the whole 179 series which he tried, *without one exception*. In making up the first table we have selected instances of as widely varying pressure as possible, in order to show our readers just how much range there is in the ratio of the friction to the pressure.

We shall publish next week the most important results obtained by Morin in his experiments on the friction of *journals*, with his general conclusions and practical hints. These will be found very valuable to such of our readers as have not chanced to meet with them.

PRODUCTION OF A COPPER GREEN WITHOUT ARSENIC.

BY PROFESSOR H. DUSSANCE.

The green of Scheele and Schwanfurtz (arsenite and arseniate of copper) are much used in the manufacture of paper-hangings, buildings, paintings and many other arts. Their preparation is a dangerous one; and, lately, a great many poisoning cases have occurred from their use in covering the walls of apartments. I think it will be a great benefit to make known some colors having the same optical qualities as the foregoing, without their chemical dangers. I have found a method of making a green equal to the one of arsenic, and not so dangerous; and I believe it will be used. There are several ways of preparing it. I will describe the two that are quickest and cheapest:—

First, Take 19 lbs. of quick lime, slack and mix it with water to make a milk of lime; add to to it a solution made with 100 lbs. chloride of copper; then boil the mixture for some time, and filter through canvas. The portion which remains in the filter (the precipitate) is the coloring matter. Wash it with hot water, and dry it at about 90° Fah. The filtrate is a mixture of chloride of copper mixed with a chloride of calcium. To prepare the chloride of copper, dissolve, separately, in hot water 62 lbs. fused chloride of calcium and 100 lbs. sulphate of copper; mix the two solutions, and shake well. It forms chloride of copper, soluble, and sulphate of lime, insoluble. Filter this through a canvas; the sulphate of lime remains on the filter, and the chloride of copper passes on the filtrate. The precipipate is washed with hot water. The above quantities gives 75 lbs. anhydrous chloride of copper.

Second, The same color could be obtained in boiling for about one hour 47 lbs. of whiting (carbonate of lime) with 100 lbs. sulphate of copper, filtering and washing the precipitate (which is the color) with boiling water, and drying it at about 90° Fah. In substituting the carbonate of magnesia for carbonate of lime, the same product is obtained.

Colors prepared by these processes are solid, durable, and acquire brightness with artificial light, while they do not present the dangerous properties of the arsenical preparations.

I must describe another industrial application of these important re-actions, which could be applied with advantage. If we heat the carbonate of magnesia with sulphate of copper, as above, we obtain three products: first, the green chloride; second, carbonic acid gas, which could be used in the preparation of aerated waters; third, sulphate of magnesia, so important in medicine. If the manufacturer has only for his object the preparation of carbonic acid and sulphate of magnesia, he may substitute sulphate of alumina for sulphate of copper.

These chemical re-actions are important enough to call the attention of manufacturers; and it will be a great benefit for many trades to substitute these preparations for the dangerous colors prepared with arsenic.

LAKE SUPERIOR COPPER.

The Lake Superior *Miner* states that a discrepancy lately found its way into our columns, regarding the amount of copper obtained from the mines of that region during the past year. "Instead of being 696 tuns, as stated, it was about 6,096 tuns, as follows:—

Ontonagon district		2,610 tuns.
Portage lake	"	1,573 "
Eagle river	"	1,301 "
Eagle harbor	"	607 "
Copper harbor	"	3 "

These sums, adding the fractions omitted in the above, give the total shipments last year, 6,095 tuns 1,621 lbs. Perhaps the error in the quotation we make may have occurred by setting down the total product of our mines last year, 6,096 tuns, and the typo left out the cipher, which the proof-reader failed to correct."

If our cotemporary had constantly conned the carefully-revised columns of the SCIENTIFIC AMERICAN, he would have seen that we published the substance of the above "correction" on page 187 of the present volume —*ten* weeks ago!

We learn from the *Miner* that the copper-mining business is active and apparently prosperous. It says:—"We are not at present working, probably, on any 400-tun mass, as we were two years since, but there is more mass copper showing in several of our best mines than at any previous period in the history of the country. Three mines in Rockland township, twelve miles from this village, are yielding in the aggregate about 270 tuns of copper per month."