Concerning the coil itself, it may suffice to say that the outer coil weighed nearly 11 tuns, being formed of eighteen ordinary bars joined together at the ends, the total length being 201 feet. The inner coil, 170 feet long, weighed about 9 tuns, making, therefore, a total of 20 tuns as the weight of the whole. In a minute after the coil was withdrawn from the furnace the great hammer began its work, thundering down upon the whole hot metal, speedily reducing the hight of 9 feet or more, which the cylinder originally possessed. The broad face of the hammer, having a diameter of nearly 5 feet, was insufficient completely to cover the upper end of the coil, but the latter was shifted, so as to secure equal pressure. Presently a hollow mandrel of suitable size, in form resembling an ogival-headed shell was placed, point downwards, on the upper end of the coil, and driven fairly into the center of the mass, so as to fill up the otherwise open space. The coil was then skillfully thrown on its side, and made to rotate on the ground while the hammer struck its sides, the inserted mandrel preventing any distortion of figure. Lying on its side the coil still stood fully 5 feet high. The entire operation was most satisfactorily performed, its object being to weld together the whole of the coiled bars into one compact mass. To complete the operation the coil would have to be re-heated to the welding point, and hammered at the other end. So far there were no signs of failure, and we can only hope that the gun will stand as well in the proof as this portion of it has in the heating.

"Concerning the 35-tun gun, we may observe that another formidable operation has to be gone through, namely, the welding together of the trunnion hoop and the breech coil, when about thirty tuns of metal at a white heat will have to be dealt with. As for the time when the great gun itself will be ready for proof, our original estimate will most likely hold good, and we must not expect to find this stage arrived at until nearly the end of the year, though if it were needed the process would be expedited. In regard to the rifling of the gun, the twist will be sharper than that which has been observed in other big guns of the Woolwich pattern. A greater spin will thus be given to the projectile, which is the more necessary, as the smallness of the bore, coupled with the extreme weight of the projectile, renders the latter unusually long."

Correspondence.

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

Wharves and Piers for New York.

MESSRS. EDITORS:—As I understand, the question as to the best mode of constructing the wharves and piers for the city of New York is undecided, consequently still an open one. In reading the plans presented in your columns, though varied and differing materially in detail, yet I do not find them covering points that are to my mind important, and should be considered in the reconstruction of the wharves and piers for your city. As they may aid in making the present attempt a success, I venture to present them for the consideration of the commission appointed to decide upon the best plan presented for this great work, so necessary to meet the wants of trade and commerce, and as a sanitary measure for the protection of the health of your crowded city. Although wood has heretofore been the principal material used in the building of wharves and piers, yet it will be generally admitted that, though least expensive at first, it is, in the long run, the dearest, as it is less serviceable than stone or iron, and from its perishable quality requires constant repairing and renewal, and its absorbing nature makes it an activeagent in poisoning the atmosphere with its exhalations drawn from the liquid filth floating in the docks washed from your streets and sewers. Stone and iron not being subject to these influences, the most durable of the two should be the one selected as the proper material for the principal part and the most exposed parts of the structure; and believing iron that one, I would propose that cylindrical piles of iron be sunk down to a solid ground base, and when thus set the piles be filled with stone and cement up to or above high water mark. The frame-work for the piers to be of iron, and the parts forming the water wall to be plated with iron, rolled to the desired size, these to be fitted in grooves in the sides of the piles, one above the other, up to the "string piece," which should be of heavy timber, and laid so as to extend a sufficient distance beyond the face of the pier, to prevent vessels from being chafed by the face of the walls. The plates forming the sides of wharves and piers to be set down below low water mark, and the open space within to be filled in with stone, coal ashes, and earth above high water. A double advantage would be thus gained, the prevention of floating decaying matter finding lodgment beneath the wharves and piers and giving additional anchorage to the structure, both of which are desirable and necessary. I would propose conducting the sewerage through sewers of iron, these to be laid under the piers to the end where they would discharge their contents in the currents, and would be thus more readily carried off to sea. To lessen the jarring caused by heavily loaded teams passing over the piers, I would lay the cartway with heavy planking, down the center of which I would lay a double-track iron railway for vehicles to pass on and off the piers.

Objections have been often made against the extension of piers out into the river, as interfering with the natural currents of the river, thereby increasing their force by these encroachments, and making navigation more difficult and perilous. As piers are necessary for the accommodation of your shipping, and the demands for additional facilities in this particular must increase, the present is the time, it seems to me, whilst remodeling your system of wharves and piers, for this to be considered, and, if possible, provided for. To that end I would suggest the abandonment of the present plan of arrangement of the piers by the substitution of one that will secure additional length to them without the necessity of extending the heads beyond their present line. As now constructed the piers extend almost in straight lines from the river front out into the river, and as a consequence their further extension brings out the objections mentioned. I would propose that the piers be constructed so as to head "*down* stream," which would prove an important increase of accommodation in the miles of piers extending around your city, and in the form suggested the washings of the streets, which now finds a quiet harbor in your docks, would more readily float out with the tide in its course to the sea, and vessels could enter them with equal if not greater facility than now. For the several reasons that I have offered I think my plan for docks and piers has some advantages over those hitherto presented. U. B. VIDAL.

Philadelphia, Pa.

Speed of Circular Saws.

MESSRS. EDITORS:—We notice in your issue of July 23d, that Mr. C. H. Crane writes you from Greenville, Ala., the result of twelve hours' sawing with one circular mill, showing a total of 34,050 feet of boards and plank cut. He seems to think it a remarkable day's work. We think he did very well; but Ruddock & Gifford, of Manistee, Mich., within *eleven hours,* cut 220,773 feet of boards, joists, and scantling, with two circular mills, one a 54-inch, and the other a 56-inch saw, and a siding mill 36-inch saw. They also had in use two edgers. Doubtless Mr. Crane's "circular" did not edge the boards. But, in any view, it will be perceived that this is vastly in excess of the Alabama feat. There is no doubt of the correctness of this statement, as we have the lumber inspector's certificate. Besides, the lumber was sold in Chicago by the same "tally."

The first full day's sawing done at Danaher & Melendy's new mill (two circulars), in Luddington, Mich., tallied 73,000 feet for an eleven-hour's run. Your correspondent asks, "Has it (his sawing) ever been equaled?" We ask, has Ruddock & Gifford's ever been nearly approached?

In explanation, we would further say that the *great day's* sawing was done in Norway pine timber, on trial. Logs scaling 160,000 feet were selected for the day's work, supposing this would be enough; the balance was taken as it came, from the boom. The work of Danaher & Melendy is their ordinary average now.

If your correspondent claims an advantage of timber in our favor, we will state that Cook, Gibb & Co.'s mill (one circular and edger) *averages* 25,000, and on one trial cut 40,320 feet of boards, *Southern* pine. This was at Little Rock, Ark.

Milwaukee, Wis. MENZEL, STOWELL & CO.

Pocket Chronometers.

MESSRS. EDITORS:—Pocket chronometers seem to have fallen into disfavor with Mr. J. Muma, and he asks some questions concerning them, which, from a "watchmaker's standpoint of view," seem ignorantly foolish. It does not follow, because the "balance has an unlimited motion," that the hair spring can be broken by "winding or careless handling." I very much doubt whether such an accident *ever* occurred. It is certainly true that the very life can be shaken out of the watch by sheer muscular strength, so can a rat be killed by the shake of a "black and tan." But does that prove the rat badly designed or faulty in its construction? It simply shows that the rat can't stand as hard a shake as a terrier can give.

I venture to assert that no watchmaker, or any other man, ever saw so "valuable" a spring as Mr. Muma speaks of, and the very same violence and accidents will produce exactly the same deleterious "tension" upon the lever spring as upon the chronometer, and with the *additional* damage of inevitably breaking the ruby jewel.

The reason the watchmaker has "such trouble to get the spring to his notion" is not the fault of the chronometer escapement; it is the honest endeavor of the artist to adjust it to keep the most perfect time possible. The same pains-taking "trouble" attaches to the lever hair spring, when the same exactness of performance is demanded of it.

It is a lamentable fact that all kinds of watches are often treated in the most barbarous manner, and yet they are expected to endure it patiently, and without resentment. The watch, a machine as delicate as the human eye, is subjected to the violent windings and shakings of any ruthless man who may be rich enough to purchase one, but without sufficient knowledge of its delicate construction, to take the proper care of it.

Cleveland, Ohio. R. COWLES.

To Stain Butternut in Imitation of Black Walnut.

MESSRS. EDITORS:—To stain butternut in imitation of black walnut, wash the wood thoroughly with lime water (*Liquor calcis, u. s.?*) and varnish or polish. This will give a perfect imitation of the fine lines and grains, as desired. Have never experimented on other soft woods.

Cherry washed with lime water will make *good mahogany.*

Derby Line, Vt. FRONTIER.

Change of Course in the Gulf Stream.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN, May 7, 1870, is a brief notice of a paper by Dr. Hayes, on the Northmen of Greenland, joined with Prof. Henry's remark that it devolved on some one to find data for the climatic changes, and suggests the theory of the first cooling of the earth at the poles.

I think that on reflection, Prof. Henry will abandon that theory as untenable, when he remembers that these changes have occurred within the historic period (A. D. 986), and not quite one thousand years ago.

It seems to me that another theory will account for the changes.

The uniformity of climate in Ireland, and the comparatively mild climate of Western Europe, is attributed to the Gulf Stream. Now from what we know of all large streams of water, they are constantly changing their courses. These changes are sometimes due to an obstruction to the current by some impediment that the stream *cannot* carry away in solution, and sometimes to a cut which the stream *does* make. Let us suppose that in A. D. 986 the Arctic current came down through Baffin's Bay, as it does at present, bringing with it innumerable icebergs and fields of ice loaded with stone and earth; and that the Gulf Stream then ran closer in to the coast of North America, and near to the east coast of Greenland. Would not East Greenland then have had somewhat the climate of Ireland or Norway, and would not the Northmen have considered it a very desirable country? Now this stream of warm water would be continually melting the ice of the Arctic current, and depositing along its west border the earth and stone it brings from the Arctic regions. Might not this be sufficient in the course of some centuries to deflect the current to the east, and so, deprived of its warm breezes from an open sea, the east coast of Greenland goes back to ice and snow.

The pouring of this current of water into the Arctic Ocean west of Norway, would render it necessary for a current to set *out* of that ocean somewhere, and if it takes the direction southward by the coast of Greenland, of course the temperature of that continent is still more reduced.

This deposit theory is not, however, sufficient to account for so great a change in so short a time (350 years); but if we may be allowed to suppose a gradual elevation of the coast of North America, and the bed of the ocean about the banks of Newfoundland, I think we will have a cause sufficient for the deflection of the Gulf Stream, and the consequent change of climate.

At any rate, I should look for the cause of the change, in ocean currents, and not in the cooling theory.

G. B. N.

Speed of Circular Saws.

MESSRS. EDITORS:—In Vol. XXIII., No. 4, new series, page 51, and signed C. H. Crane, an article appears on "Speed of Circular Saws and Saw Mills." Is it to be understood that Mr. Crane has made any new discovery on the speed of circular saws? or to feed three inches to each revolution is in any way extraordinary?

I have seen a fifty-four inch saw running at 1,000 revolutions per minute. This would run the periphery of the saw a little more than 14,000 feet per minute. I have also seen a thirty-six inch saw running 2,000 revolutions per minute, or a little more than 1,800 feet. If a circular saw is kept nicely balanced, made of good material, and of even temper, a very high rate of speed may be obtained with safety. The very best millwrights and sawyers differ widely on the proper speed and feed of circular saws.

Steel is possessed of an amount of elasticity, varying according to the quality and temper. A circular saw running at a very high rate of speed must be hammered open between the center and rim. This is in order to give the rim a chance to expand by the velocity. A saw may be hammered so that the center will be loose and drop each way, like the loose bottom of a tin pan, and so that it will not maintain a true or straight position on the mandrel when standing still. But when at a high rate of speed, the rim will be so expanded that the saw will become true and do admirable work. But the saw will only bear a certain amount of expansion and contraction, and, as I before stated, this somewhat depends upon the quality and temper of the saw. If very soft, it would bear expansion, but not much contraction. Saws running at great velocity are more likely to become expanded on the rim. Practically it is not a question of how great a speed may be obtained, but what rate of speed is most practical for all purposes or general use.

Three-inch feed for a sixty-six inch saw would be considered light by our Western sawyers, and 34,050 feet of inch lumber to be sawed on a test day's work moderate sawing. There are plenty of circular saws in Michigan and Wisconsin that run regularly on five inch feed, and some even on six. And many of those mills average 35,000 feet of lumber per day with one circular saw running ten hours. I will mention one mill that I timed three years ago. It is owned by Messrs. McCarther & Co., at Winne Conne, Winnebago county, Wisconsin, on the Wisconsin river.

I held my watch. A log sixteen feet long, that squared eighteen inches and four side boards, was rolled on to the carriage and sawed into inch boards, splitting the last plank in 4½ minutes. Eight boards sixteen feet long were sawed in one minute. This mill was not sawing on a test at the time, but was in the usual course of running. Allowing this log to make 424 feet of lumber, and five minutes time to saw each log, the mill would cut 5,088 feet per hour, and 120 such logs in ten hours, making 50,880 feet of lumber. I was told that this mill sawed 42,000 feet in ten hours. Other mills on the Wisconsin and Saginaw rivers claim to beat that amount. McCarther & Co.'s mill feeds 3¾ inches, and the saw runs 750 revolutions per minute. I have known trouble to arise in consequence of running saws at too great a speed, and also in feeding too heavily. It should not be a question of how much speed a circular saw can be run, or how much feed can be crowded on. But what is desired is to ascertain what a saw will do, and do it well, day after day. I am inclined to think if Mr. Crane would reduce the speed of his sixty-six inch saw

one fourth and add one fourth to the feed that the result would be more satisfactory in the long run. This, however, is a matter of opinion, and Mr. Crane may be correct. I hope we may hear from other experienced millwrights and sawyers on this subject. We cannot have too much light on this subject in this timbered country. J. E. EMERSON.

Pittsburgh, Pa.

The Workman in Switzerland--His Favorable Condition.

In the course of a series of articles in *Chambers' Journal*. entitled "The Artisan in Europe," the writer shows in a favorable light the condition of the workingman in the Republic of Switzerland, as compared with that of his fellow-workmen in monarchical countries:

"In Switzerland the mass of manual workers are better off than in countries of prouder pretensions. Not that the Swiss workmen are paid highly--we fancy few of them make so much as a pound a week—but they are helped in so many ways, that we hardly know how to set about the enumeration. In the first place, all Swiss children being bound to attend school up to the age of fifteen, first-rate schools are provided, which, if not in all cases free, provide education at a trifling cost, not exceeding (except in Basle) a charge of three francs—in Berne it is one franc—per annum, and even this is lessened in the case of poor people. So well is Switzerland covered with public schools, that private ones are scarce, and in some Cantons do not exist at all. After leaving the primary school the young artisan can continue learning at the 'Repetition Schools,' or the evening and Sunday schools, and can obtain a higher degree of instruction afterwards at the industrial schools to be found in the most populated districts. Then, in several localities, there are special institutions for special subjects. Geneva has its drawing school; Stanz, its school of design; Lausanne, its school for modeling, carving, and sculpture; and Lugano its school for instruction in the application of chemistry to art and industry.

"Nearly every commune boasts a circulating library, well stocked with general literature and technical works, and every town has its museum of art, archæology, and natural history. Since in the more lucrative trades, premiums are required with apprentices, institutions abound for the purpose of paying for the instruction of poor lads. At Locle, there is a a school for instructing them in the mystery of watchmaking; and similar schools exist at Chaux-de-Fond and Geneva, where, for the payment of five francs a month, apprentices are taken and taught so well, that in three years' time they are able to earn their own livelihood.

"Most artisans either own or hold from their commune small plots of land, which contribute something towards their maintenance when work falls off or fails altogether. In the latter unhappy contingency, if he cannot get employment through the agency of some society, the workman has little difficulty in borrowing sufficient to supply his necessities for a time, either by depositing some article of his manufacture at a 'bazaar,' and receiving an advance upon it; or by borrowing upon his future wages from the savings bank, people's bank, or mutual credit society. In fact, there is too great a facility for borrowing, and in some towns the evil effects of the borrowing system are heavily felt.

"At all Swiss factories it is customary to sell food to the hands at cost price; then co-operative stores for the supply of provisions and other home necessaries are well supported, so that the workingman gets his meat and other food as cheaply as possible. His bath costs him nothing, and washing very little; in the principal towns there are public wash-houses, for the use of which, with their machinery for bleaching, drying, and ironing by steam, from three farthings to three half-pence an hour is charged. In forest districts it is usual to distribute fuel gratuitously; in other districts, the like is done by corporations, employers, and benevolent individuals. Almost the only thing for which the artisan is thrown entirely upon his own resources is clothing; the co-operative societies afford him no assistance that way.

"House room is in many cases provided by employers, in order that the men may be near them; where the employers fail the philanthropist and co-operative society step in. The accommodation consists generally of two or three rooms, kitchen, cellar, loft, and small garden, for which the occupier pays from 13s. 4d to 18s. 4d. a month, or less than that in some parts; while a single man can get board and lodging for the sum of six to eight shillings a week. There is not so much solicitude shown for him as for the married artisan. But the traveling workman is not entirely forgotten, free sleeping accommodations being supplied him by many public institutions. In Neuchâtel he can always be sure of a bed, and at Olten of a meal as well, without having to open his purse; while the 'hospices' and houses of refuge scattered over the summits of the Alps, over the St. Bernard, St. Gothard, the Grimsel, and other passes, are ever ready to open their doors to him, supplying him not only with a bed and as much food as he can desire, but when illness attacks him, providing kindly attendance for days together, with a parting gift of good shoes and warm clothing. All operatives are also very considerate to each other, and give a hearty welcome to their itinerant brothers.

"Although the Swiss works under very favorable conditions, he is not without his grievances. Like the jury-women of Wyoming, who were locked up four days and nights, he finds the privileges he enjoys are not without their accompanying evils. The exercise of his political rights involves a great loss of time; and in some Cantons he cannot escape exercise of them, fines being levied upon all citizens declining to take part in the various elections. Then his working days are diminished by the drill and field days which every Swiss, up to a certain age, is compelled to attend; while an overabundance of religious festivals, in the Protestant as well as the Catholic Cantons, further limits his earning capacity. Those artisans—and they are many—who work at home suffer from too sedentary a life, although the evil is counteracted in some measure by the national fondness for walking and gymnastic exercises.

"Employers mix so much with their workpeople, and are so unwearying in their efforts to improve their condition, that a very enviable state of good feeling exists between masters and men; and the conflict between the two, which arose two years ago, at the instigation of the International League, was one of foreign origin, and left no ill feeling behind."

Improved Bogie Engines and Elastic Self-Adjusting Railway Carriage Wheels.

Mr. George Smith, M. Inst. C.E., of Belfast, Ireland, has, according to the *Mechanics' Magazine*, just introduced to the public some improvements in bogie engines, which consist of an arrangement of segmental-headed pins or bolts attached to framings of the engine and bogie, and so constructed as to allow of a true motion round the center, and admitting also of a compound transverse and circular motion by means of slots made in the slides. The engine, carriage, and bogie frames are always in contact, and sliding upon each other. The weight is equally distributed amongst the wheels of the bogie by means of a system of compensating levers connected to the springs.

The novelty of these wheels consists in the body, hoops, spokes, or disks being suspended to the tires. By such an arrangement the tires are in compression as well as the body, spokes, or disks, while the hoop is always in tension; the reverse in principle to the constructions at present adopted.

The advantages are cheapness, lightness, durability, greater safety to the trains, especially at high speeds, as the tires cannot separate or break from the body, hoops, spokes, or disks of the wheels; nor can they mount the rails. As the tire shears, instead of biting, there are less jolts, less tear and wear to engines or carriages and permanent way; no skidding or sliding or lateral concussions, nor any necessity for double rails at sharp curves. The improvement also prevents torsion to cranks and axles. As the tires regulate themselves to the irregularities of the permanent way, there will be less straining or vibration of the bridges on account of the elasticity of these wheels. Lastly, it is found that with these wheels in use there is no need to loosen the ballast, as is often done, to give elasticity to the rails, so as to lessen the hammering of the rigid wheels as at present constructed. The jolts and jars now felt in going over loose joints of the rails, and especially on bad, rigid, or frozen roads, are greatly if not entirely prevented (a boon to passengers, especially in long journeys). The arrangement also enhances the safety of the body's spokes, or disks of the wheels, whether made of wrought or cast iron; as they are loosely suspended in elastic steel or iron hoops, they may expand or contract without strain or contortion to the several parts, under all changes of temperature, whereas in the tire and body of the old wheel there is a constant danger, in consequence of their unequal expansion and contraction, more particularly in sudden changes of the weather. These improvements are obtained by suspending the axle from the top of the wheel by means of an elastic steel or iron hoop, which allows for any inequality in the rails, while at the same time the tire is free to revolve independently of the body of the wheel.

The disadvantages or defects of the present wheels are their tendency to mount the rails, and their liability to sliding and lateral concussions, thereby occasioning oscillations of the train, matters which not only engineers but ordinary railway passengers cannot fail to have observed; but, beyond these defects, and not so obvious to the uninitiated, are loss of power in traction by the unequal wear and tear of the tires; also unequal expansion and contraction of the tires and body, torsion of the cranks and axles; and these defects are greatly increased, should the frames of the engine or carriages get out of the square by twisting or straining, leaving out of the question bad roads, unequal lengths of the rails at the various curves, all of which have to be taken into consideration, independently of the straining and vibrations of the bridges when passing over, as well as the enlargement of the engine tires, when they have to be taken off and reset. There is also the ever-present danger of the tires, when at high speed, separating or breaking from the body of the wheel, to the destruction of the train and danger of life, all owing to their being fixed on the axles.

The object of the self-adjusting, elastic, or suspended wheels is to obviate the above-mentioned disadvantages or defects of the fixed wheels now in use, to obtain which is to have the elasticity as close as possible to the working point between the wheel and the rail, as all unnecessary weight interposed between the axle and the rail is adding inertia, thereby increasing the wear and tear of the wheels and rails.

An Excellent Opportunity for a Fortune.

The editor of the *Working Farmer*, one of the best of our agricultural weeklies, makes the following suggestion regarding improvements in agricultural machines:

"There is a large field open for inventors in the line of efficient labor-saving agricultural implements of several kinds, and especially as it regards subsoil plows. There are several kinds of instruments now constructed for the purpose of pulverizing the substratum beneath the surface soil; but, they are all very far from possessing the efficiency which is of pre-eminent importance in an implement of this character. The implements in use, at the present day, which are employed to loosen and pulverize the subsoil, often render a portion of it more compact than it was before the plow was driven through the stubborn ground. When the substratum is composed largely of argillaceous and unctuous clay, if a subsoil plow be employed to pulverize a portion of it, say a few inches in depth, the share and flange will pass through the clay, almost like a "mole ditcher," compressing the compact clay into a still smaller compass than the particles ever were before. If the flange of the plow be elevated so as to lift the furrow slice higher than usual, much of it will drop back in its original bed, without having been pulverized to an extent that would be of any practical value to the growing crops.

"The great desideratum in a subsoil plow, is an implement so constructed that it will reduce the compact substratum beneath the surface mold, to such a fine state of comminution, that water will settle down through it as fast as the rain descends. One great object in subsoiling is to render the lower portion of the seed bed so fine and mellow that roots of growing plants will meet with but little resistance in their passage through the compact particles. When the impervious substratum is broken up and rendered firm the process obviates the necessity for underdraining. Hence, the construction of the implement must be of such a form that it will break up and pulverize the furrow slice thoroughly, and leave the fine particles in the bottom of the furrow that was made by the common plow. When the surface soil and the subsoil are both of such a character that it is desirable to turn the subsoil to the surface above the fertile mold that constitutes the soil, a subsoil plow is not required. On the contrary, when the character of the surface soil is such that it is of eminent importance to keep the mold on the surface, a subsoil plow is indispensably requisite.

"Inventors can readily perceive by these suggestions what are the operations to be performed in subsoiling. Hence, the person who will bring out an efficient implement for this purpose, can scarcely fail to secure a fortune, provided he will manage judiciously with his invention.

A Murderous Sea Flower.

One of the exquisite wonders of the sea is called the opelet, and is about as large as the German aster, looking, indeed, very much like one. Imagine a very large double aster with ever so many long petals of a light green, glossy as satin, and each one tipped with rose color. These lovely petals do not lie quietly in their places like those of the aster in your garden, but wave about in the water; while the opelet generally clings to a rock. How innocent and lovely it looks on its rocky bed! Who would suspect that it could eat anything grosser than dew or sunshine? But those beautiful waving arms, as you call them, have another use besides looking pretty. They have to provide food for a large, open mouth, which is hidden deep down among them—so well hidden that one can scarcely find it. Well do they perform their duty, for the instant that a foolish little fishlet touches one of the rosy tips he is struck with poison as fatal to him as lightning. He immediately becomes numb, and in a moment stops struggling, and then the other beautiful arms wrap themselves around him, and he is drawn into the huge, greedy mouth and is seen no more. Then the lovely arms unclose and wave again in the water, looking as innocent and harmless as though they had never touched a fish.

Improvements in Medical Instruction.

Optics and photography are now employed with success in imparting medical instruction to students. The leading medical hospitals and colleges in this country and Europe now regularly employ skilled photographers whose business it is to take photographs from the patients of all peculiar manifestations of disease or surgery. Faithful representations of the general appearance of a patient, or of a diseased member, such as the limbs, the throat, the eyes, the hair, are obtained. These may be subsequently enlarged or reduced as desired, and reproduced on glass in the form of transparencies, then colored with transparent pigments. By means of the magic lantern the pictures are thrown upon a screen and magnified so that the minutest parts are rendered clearly visible to large audiences. For medical instruction this method is of great value by reason of its extraordinary accuracy and distinctness.

Reading by Machinery.

Peter F. Carr, of Camptown, Pa., says he has invented a method of reading books by machinery, which he avers will be one of the marvels of science, calculated to astound the world.

We are not informed as to the particular form or advantages of the invention, but we presume that it is intended, like some other labor-saving machines, to do the work of at least one hundred men. If so, one may read a hundred books at once, or perform the literary labor of an entire week in half an hour. For editors, lawyers, and other scribblers, what a boon will this invention prove! With two or three of these machines a man might make himself immensely learned, for he would be able, in one year, to read up all the principal books in the world.

Mr. Carr wishes the assistance of inventors, artisans, capitalists, and men of means and education in order to develop his grand discovery.

THE composite roller now in use by printers was the chance discovery of one Edward Dyas, printer and parish clerk of Madeley, in Shropshire, England. His glue-pot having been upset, and Dyas not having a pelt-ball ready at hand, he took up a piece of the glue in a soft state, and inked a form with it so satisfactorily that he continued its use. He afterwards added treacle to keep the glue soft.

Improved Shingle Machine.

Our engraving illustrates a new machine for cutting shingles from steamed bolts, whereby much better shingles are made than we have ever seen produced by any other machine operating on a similar principle. In fact, shingles which have been shown us as samples of the work done by this machine, and which the inventor assures us are only a fair average of its work, are certainly better than sawed shingles, being remarkably uniform in thickness and taper, smooth on the surface, and totally free from checks.

This result is obtained by using a very thin, broad knife, and giving it a drawing stroke in cutting by means hereafter to be described. The parts are few in number and of simple form. They are all well shown in our engraving, except the device for gaging the taper of the shingles, which is partly concealed by other more important parts of the machine, but the principle of which will be easily comprehended from the description below.

The machine receives motion at the fast and loose pulleys, A, transmitting it through the gear and pinion, B, to the crank wheels, C. These impart vertical reciprocating motion to the beam, D, which carries a table upon which the steamed bolt is placed in cutting.

The pitman, E, which has its lower end pivoted to one end of D, operates a radial lever, not shown, which gives reciprocating motion to the toothed sector, F, and to a rack attached to the straining beam, G. This straining beam is very rigid, is arched, as shown, and carries a long, thin, and broad knife, H, stretched very tightly between its extremities by means of screws. This knife is from one foot to fourteen inches in width, and its thickest part is not more than three eighths of an inch.

The rack and toothed sector, F, cause this knife to traverse from end to end, while the beam, D, carrying the table and bolt, is pressed upwards towards its edge, thus securing a drawing stroke lengthwise of the grain.

The bolts are placed by the attendant upon the table, and held up against guides which operate automatically, in conjunction with the other movements of the machine, to thrust first one end forward and then the other, so as to give a uniform taper to the shingles. This movement is effected by two cones affixed to a shaft in such a manner that the action of the cams upon their bases and a coiled spring between them causes the cones to reciprocate in a longitudinal direction with reference to the bolt; and the cones acting on suitable devices produce the alternate advance and retreat of the guides as required.

Each ascent of the table cuts a shingle, and the extreme thinness of the knife, rendered possible by straining it like a saw in the arched straining beam, obviates the checking and splitting, hitherto the chief objection to machines of this class.

The machine makes seventy twelve inch cuts per minute, and hence works with great rapidity; and while in our opinion it makes a better shingle than can be done by sawing, it saves all the waste of saw kerf. This saving is itself a large profit to the manufacturer.

The tension given to the knife is ten tuns, and this prevents all trembling or stammering in its cut ting.

The shingles made by the machine have, we are informed, been laid and tested in actual use, proving themselves equal to all requirements of first class shingles.

Patented July 19, 1870, by James E. Austin. Address for further information James E. Austin & Co., Syracuse, N. Y.

Improved Friction Clutch.

The convenience and freedom from shock in the use of friction clutches have rendered them almost essential to many kinds of machinery. Many devices of this kind have, however, proved unsatisfactory in use, as they were likely to get out of order, had in some instances no provision for taking up the inevitable wear, and otherwise proved troublesome to manage.

The device herewith illustrated, fulfills, it is claimed, all the conditions of a first-class friction clutch, and although we have not seen it in operation, except on the working model sent us, this operates excellently. We have also been shown certificates from those who have used this clutch in saw mills and in gang saws, testifying to its very satisfactory working for these purposes, perhaps as good a test of such a clutch as can be made.

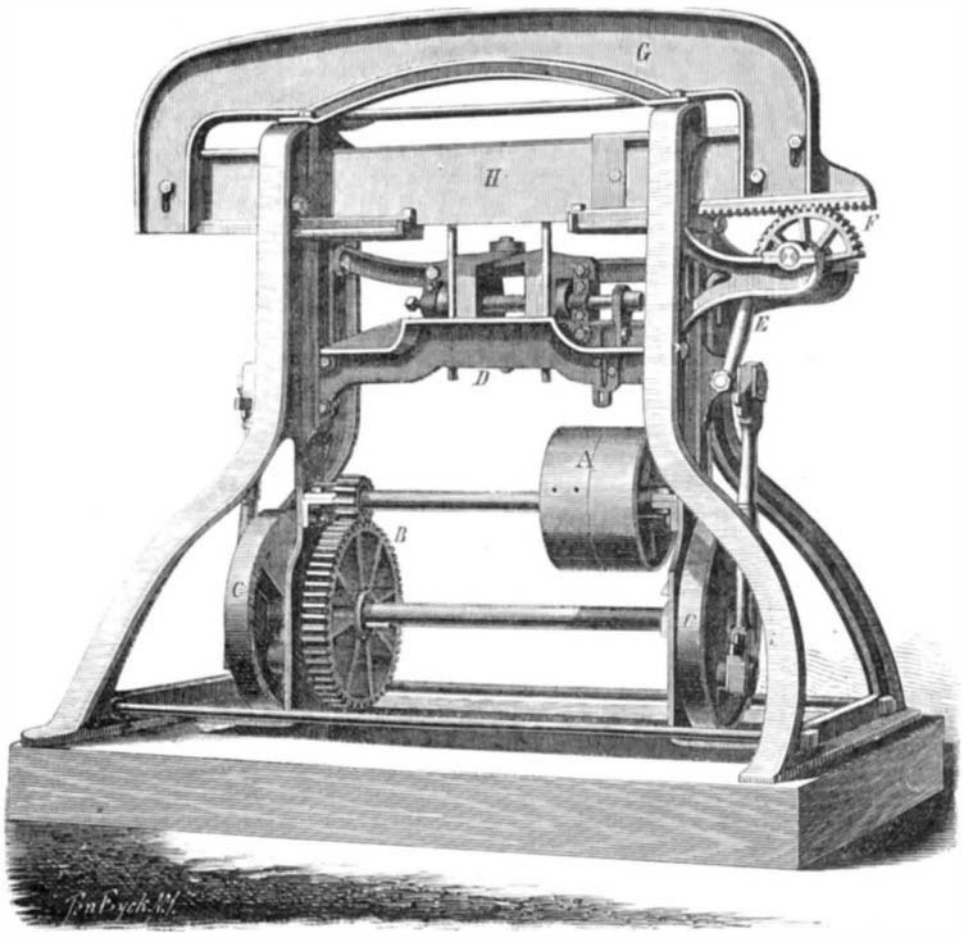
Our engraving is a perspective view of the clutch, with portions broken away to show details of construction.

A is the shaft, and B a pulley arranged to revolve on, and independently of the shaft when not clutched.

C is an annular disk, or ring, attached to the inside of the rim of the pulley by screws, or in any other desirable manner. D is an interior disk, and E an outer annular disk or ring. The disk, D, is made to approach and gripe the fast ring or disk, C, and thereby produce the required friction.

The friction disks, D and E, are connected with the disk, F, by a link system, F being keyed to the shaft.

The triangular plates. G, are attached to F by screws, and these plates have also adjusting screws, H, which take up the wear of the friction disks.

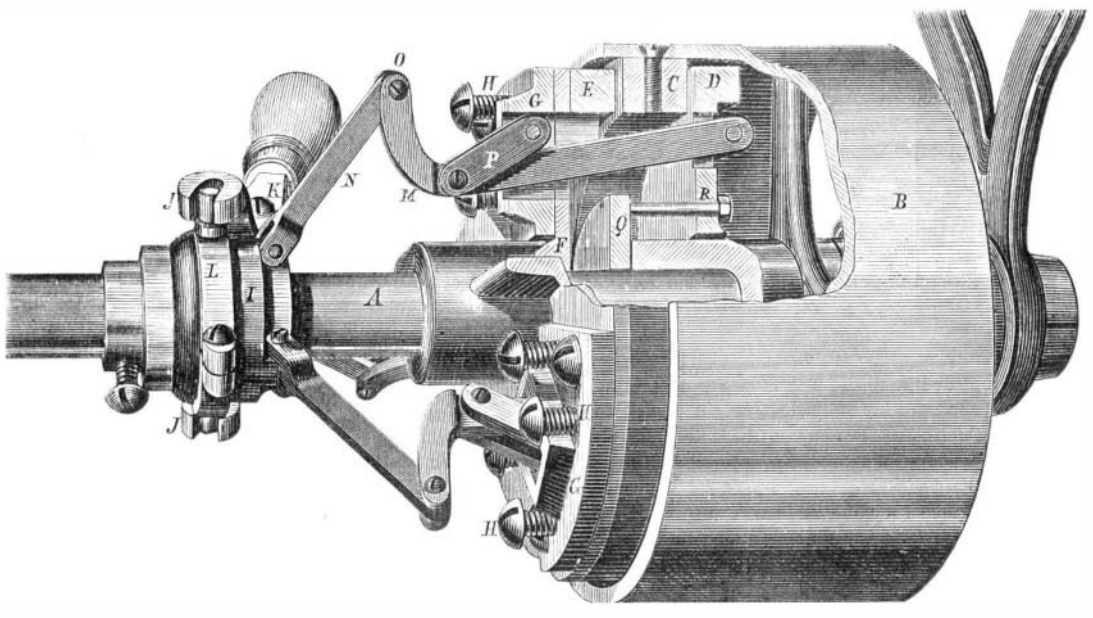


AUSTIN'S IMPROVED SHINGLE MACHINE.

The hub, I, revolves with the shaft, and is made to slide thereon by the forked lever, J. This lever has its fulcrum at K, and is connected with the hub by a band, L, fitting a groove in I. The band, L, is made like an eccentric band, in two parts, and has lugs with which the lever, J, engages.

The inner friction disk, D, is connected with the sliding hub through links, M and N, the links, M, being bent, as shown; M being pivoted to D, and N to the hub, and the two being pivoted together at O.

The outer friction disk, F, is connected with the links, M, by the links, P, pivoted at both ends. The links, P, are placed at an angle with the links, M, so that when the outer ends of the latter are moved away from the shaft, the disk, D, is pressed against the ring, C, drawing it and the pulley, B, against the friction-disk, E, producing friction upon both sides



LULL'S FRICTION CLUTCH.

of C, and thus clutching the pulley to which C is fixed. A collar, Q, is pulled back by the bolt, R, which connects it with the disk, D, whenever the pulley is released from the action of the friction disks, and draws the pulley away from the disk, E, so that it revolves without friction, or remains at rest, as the case may be.

The principle of the toggle-joint is embodied in the system of links, so that great purchase is obtained, and the motion of the lever necessary to clutch or release the pulley is very slight. Patented, May 31, 1870, through the Scientific American Patent Agency, by Orrin Lull, of Rochester, N. Y.

Address, care of Kidd's Foundery and Steam Engine Manufacturing Company, 106 Mill street, as above.

Remarkable Illumination of the Sea.

A correspondent of a German journal, writing under date of April 11, from the Gulf of Siam, says:

"Last night, between two and three o'clock, I had the opportunity of witnessing an illumination of the sea of the most peculiar kind. It had become quite calm, after a sharp breeze which had sprung up from the N. N. W., caused by a passing storm in the distance. Heat-lightning was still very frequent in the west horizon, and the sky was covered with light clouds, through which the moon shone rather brightly We took in sail and set the engines going. I then noticed in the water large white flakes which I had at first taken to be reflections of the moon; they were about a fathom in diameter, apparently lusterless, and of no particular shape, like objects seen lying deep in the water. By the rising and falling of the sea's surface these flakes floated off to a short distance from the ship without imparting any noticeable increase of brightness to the water illuminated by the moon's rays. After steaming further forward for six or seven knots, a most wonderful spectacle presented itself. On both sides obliquely in front of us, long white waves of light were seen floating towards the ship, increasing in brightness and rapidity till at last they almost disappeared, and nothing was observed but a white lusterless, whirling (*schwirrendes*) light upon the water. After gazing for some time it was impossible to distinguish between water, sky, and atmosphere, all which were but just now clearly distinguishable, and a thick fog in long streaks appeared to be driving upon the ship with furious swiftness. The phenomenon of light was somewhat similar to that which would be produced by the whirling round of a ball striped black and white so rapidly that the white stripes seem to be lost and blended with the dark ones. The light was just as if we were enveloped in a thick white fog. The direction of the waves of light upon the ship was always on both sides obliquely from the front. The phenomenon lasted about five minutes, and repeated itself once more afterwards for about two minutes.

"Without doubt, therefore, shoals of small creatures in the water were the cause of this luminosity, and the waves of light find their cause, according to my conviction, in the white flakes above described. Yet their moderate velocity of one and a half geographical miles per hour, and the weak light at first emitted by each flake, so weak as not to influence the tint of the surface-water, does not seem calculated to call forth a phenomenon of such magical effect as the one described. The luminous appearance commonly seen in the wake of a ship, or in water disturbed by oars or rudder, is not to be compared with such a phenomenon as the above. In the former the light is lustrous, glaring green and blue, like phosphorus, often very splendid in deep clear water, mingled with a reddish white foam. We saw a beautiful instance of this kind one night, in perfectly still and smooth water, in a lonely bay of Nipon. It was pitch dark and perfectly quiet, when a heavy shower of rain came on, in large but not dense drops. Every drop as it struck the water became illuminated, little drops of fire sprang up in the air, and a little luminous circle formed itself. It seemed as if the bay was suddenly filled with little flowers of fire. This phenomenon was almost immediately dissipated by a puff of wind."

Rustic Picture Frames.

Rustic wood for this and other purposes is in great favor now-a-days. With a little care in selection of material, and skill in handling tools, we may frame our engravings and paintings at slight cost. Oak wood, denuded of the bark, presents a beautifully corrugated surface, out o which the knife easily removes the few fibres which adhere, and it is ready for varnishing as soon as it is seasoned. The "season cracks," should they occur, may be filled with dark-brown putty, and will even heighten the general effect.

Take a thin board, of the right size and shape, for the foundation or "mat;" saw out the inner oval or rectangular form to suit the picture. Nail on the edge a rustic frame made of the branches of hard, seasoned wood, and garnish the corners with some pretty device, such, for instance, as a cluster of acorns. Ivy may be trained to grow around these frames with beautiful effect.

THERE are 12,000 windmills in Holland at the present day, for the simple purpose of drainage.