PNEUMATIC PROPULSION OF VESSELS.

The propulsion of vessels by hydraulic reaction has occupied and interested inventive minds more or less for many years. Nor is it at all strange that it should have been so. No one could live by the sea shore, and exercise even very feeble powers of observation upon the movements of marine animals, in vertebrates particularly, and fail to be greatly impressed with the advantages afforded by direct reaction of an ejected current in forcing the animal through the water.

A single illustration is sufficient. Cuttlefish are found on the coasts of most parts of the world. All along our own shores they are abundant during the summer, and are taken in great numbers for bait, being scarcely used for any other purpose. The fishermen call them *squids*. The common species of Long Island Sound is *Loligo pealii*. They often come into the shallow bays and harbors, and when pursued they dart through the water with great swiftness and with a smooth unwavering motion, which it is delightful to watch unless you are bound on their capture, and then it is not so delightful, for the capture is not easy. With a light boat, smooth water, and a strong arm it is very difficult to hold way with them. We speak from experience.

Now this great rate of speed is kept up by "hydraulic reaction." They draw in water by free expansion, and then force it out through a small aperture and are shot ahead (or rather backward, for that is the way they go) as already indicated.

This is the lesson from the squids, and we propose to turn it to account in the propulsion of boats both large and small. But we will use, not hydraulic, but *pneumatic* reaction, and we are brought by it directly into the line which we have been following so repeatedly of late in our plans for storing the wind power. In speaking of wind power for small motors (December 8), we assumed the case of a common row boat to carry a reservoir for compressed air in the form of a pipe laid along the gunwale, the pipe to be of suitable size, say two inches or three inches at choice. This quantity of air we propose to utilize for propulsion, not by driving machinery of any form for the purpose of turning wheels or a screw, but by *direct escape in a jet beneath the boat.* With this jet thrown straight backward the entire reaction from the force of the escaping current must necessarily be expended in driving the boat in the opposite direction, that is, forward, and as action and reaction are always equal, it follows that all the force stored in the compression of the air must be utilized without waste in sending the boat on her course. Theoretically this is true, and cannot be otherwise. But is it true practically? Can it be made to work?

That there are many difficulties in the way is quite manifest. The idea is nothing new, but up to the present time it has never become a matter of actual service. Various patents have been issued for devices to accomplish it, and some of them *seem* as though they ought to succeed, but evidently something is wrong for they have never come into use.

No. 216,140, June 3, 1879, granted to Brewer & Ward, Sacramento, Cal., appears to represent a specially promising plan. No. 133,758. December 10, 1872, to Lorenzo Chase, Portland, Maine, also has much apparent merit. These two are mentioned only to set our inventive friends at work to search the records, and use their own brains in improving upon past unsuccessful efforts, and for the sake of stirring their brains still further we propose to set out here our own plan, making no charge for the advice. We will try to meet and remove one or two of the difficulties.

We have not yet built one of those light draught boats, of August 18, and December 8, but we will take one of them for use at the present time, notwithstanding, in legal phrase *nunc pro tunc.*

We have our reservoir of compressed air at any convenient part of the boat, which has been filled to a proper pressure by the wind wheel. The broad bottom of the boat is provided with two keels, the depth and the distance between the two to be subject to experimental working and change, if needed. In the narrow space between these keels, and so far forward as to be nearly at the anterior edge of the part always submerged, opens a pipe so curved that its line of discharge is directly backward. This pipe is connected with the reservoir and furnished with stopcock and valve. When the stopcock is turned the current of air rushes out with violence in one direction only, that is, straight backward. The action of the current is laterally confined by the keels and above by the bottom of the boat. A free action upon the water is afforded by the constant rush between the keels as the boat is driven ahead.

The position of the jet being far forward, by which the action is allowed its full force before lateral escape is effected, is in the highest degree important, and is one of the points in which it appears to us there has been error in the previous attempts; at the same time the actual buoyant effect of the current of air, placed well forward, is not to be disregarded. In No. 216,140 this jet was placed at the very stern, and it was also set on a swivel so as to be used in steering the boat as well as driving it. This latter effect it seems to us may much more wisely be produced in the common methods.

The plan we thus suggest is of course open to all forms of criticism, but it seems to us to embody the features which are needed. The cost of machinery, the losses from indirect action and from friction, the inconveniences attending both screw and wheel, are all avoided *in theory;* let us see it *in practice.* Patent not applied for. A.

IT is estimated that 7,000,000 envelopes a day are made in the United States.

White Linseed.

The *Monthly Magazine of Pharmacy* draws attention to an exhibit of "white Nugpur linseed," and oil expressed from it, in the Indian section of the Amsterdam Exhibition. This linseed is of a lightish yellow color rather than a white, and the following account is given of it in the catalogue of the Indian exhibits: "Prof. A. H. Church, in a report on a series of experiments on this seed, states that the proportion of oil which it contained was found to be 45 per cent, an extraordinarily high proportion. No record of so large a percentage in any kind of linseed is accessible, the range being from 32 to 43 per cent, and the average about 36. He considers that this oil will be found peculiarly suitable for the purposes of the artist in oil painting, and in grinding with the highest qualities of white house paints, and thus it will secure a ready market and fetch a high price." Commenting on the supply of this linseed and the price likely to be realized for the oil, our contemporary points out that the seed as harvested is not all white, but that it has a large percentage of the ordinary brown seed mixed with it, from which it can be freed only by careful overhauling and picking, which labor must entail an increase in the first value of the seed. By carefully sowing the white seed only, a crop might be raised which would perhaps yield entirely white seed, in which case a profitable variety of linseed would be established.

Improved Cookery of Cheese.

Take one-quarter pound of grated cheese, add it to a gill of milk in which is dissolved as much powdered bicarbonate of potash as will stand upon a threepenny piece; mustard, pepper, etc. Heat this carefully until the cheese is completely dissolved. Then beat up three eggs, yolk and whites together, and add them to this solution of cheese, stirring the whole. Now take a shallow metal or earthenware dish or tray that will bear heating; put a little butter on this and heat the butter till it frizzles. Then pour the mixture into this, and bake or fry it until it is nearly solidified.

A cheaper dish may be made by increasing the proportion of cheese—say six to eight ounces to three eggs, or only one egg to one-quarter pound of cheese for a hard working man with powerful digestion.

The chief difficulty in preparing this dish conveniently is that of obtaining suitable vessels for the final frying or baking, as each portion should be poured into and fried or baked in a separate dish, so that each may, as in Switzerland, have his own *fondu* complete, and eat it from the dish as it comes from the fire. As demand creates supply, our ironmongers, etc., will soon learn to meet this demand if it arises. I am about writing to Messrs. Griffiths & Browett, of Birmingham, large manufacturers of what is technically called "hollow ware," *i. e.,* vessels of all kinds knocked up from a single piece of metal without any soldering, and have little doubt that they will speedily produce suitable *fondu* dishes according to my specification, and supply them to the shopkeepers.

The bicarbonate of potash is an original novelty that will possibly alarm some of my non-chemical readers. I advocate its use for two reasons. First, it effects a better solution of the casein by neutralizing the free lactic acid that inevitably exists in milk supplied to towns, and any free acid that may remain in the cheese. At a farm house, where the milk is just drawn from the cow, it is unnecessary for this purpose, as such new milk is itself slightly alkaline. My second reason is physiological and of greater weight. Salts of potash are necessary constituents of human food. They exist in all kinds of wholesome vegetables and fruits, and in the juices of *fresh* meat, but *they are wanting in cheese,* having, on account of their great solubility, been left behind in the whey.

This absence of potash appears to me to be the one serious objection to the free use of cheese diet. The Swiss peasant escapes the mischief by his abundant salads, which, eaten raw, contain all their potash salts, instead of leaving the greater part in the saucepan, as do cabbages, etc., when cooked in boiling water. In Norway, where salads are scarce, the bonder and his housemen have at times suffered greatly from scurvy, especially in the far North, and would be severely victimized but for special remedies that they use (the mottebeer, cranberry, etc., grown and preserved especially for the purpose; the Laplanders make a broth of scurvy grass and similar herbs). Mr. Lang attributes their recent immunity from scurvy, which was once a sore plague among them, to the introduction of the potato.

Scurvy on board ship results from eating salt meat, the potash of which has escaped by exosmosis into the brine or pickle. The sailor now escapes it by drinking citrate of potash in the form of lime juice, and by alternating salt junk with rations of tinned meats.

I once lived for six days on bread and cheese only, tasting no other food. I had, in company with C. M. Clayton, son of the Senator of Delaware, who negotiated the Clayton-Bulwer Treaty, taken a passage from Malta to Athens in a little schooner, and expecting a three days' journey, we took no other rations than a lump of Cheshire cheese and a supply of bread. Bad weather doubled the expected length of our journey.

We were both young, and proud of our hardihood in bearing privations, were stanch disciples of Diogenes; but on the last day we succumbed, and bartered the remainder of our bread and cheese for some of the boiled horse beans and cabbage broth of the forecastle. The cheese, highly relished at first, had become positively nauseous, and our craving for the vegetable broth was absurd, considering the full view we had of its constituents and of the dirtiness of its cooks.

I attribute this to the lack of potash salts in the cheese and bread. It was similar to the craving for common salt by cattle that lack necessary chlorides in their food. I am satisfied that cheese can never take the place in an economic dietary otherwise justified by its nutritious composition, unless this deficiency of potash is somehow supplied. My device of using it with milk as a solvent supplies it in a simple and natural manner.—*W. M. Williams, in Knowledge.*

A Training School for Head and Hand.

The Chicago Manual Training School has recently been incorporated, the object of its foundation being instruction and practice in the use of tools, with such instruction as may be deemed necessary in mathematics, drawing, and the English branches of a high school course. The Chicago *Industrial World* says that the following course of study is proposed, subject to whatever changes experience may dictate: First year—Arithmetic, algebra, English language, history, physiology, physical geography, free-hand and mechanical drawing. Shopwork: carpentry, wood carving, wood turning, pattern making, proper care and use of tools. Second year—Algebra, plane geometry, physics, mechanics, history, literature, geometrical and mechanical drawing. Shopwork: forging, welding, tempering, soldering, brazing. Third year—Geometry, plane trigonometry, book keeping, literature, political economy, civil government, mechanics, chemistry, machine and architectural drawing. Machine shopwork, such as fitting, turning, drilling, planing, etc. Study of machinery, including the management and care of steam engine and boilers. Latin may be taken instead of English language, literature, and history.

Through the course, one hour per day, or more, will be given to drawing, and not less than two hours per day to shopwork. The remainder of the school day will be devoted to study and recitation. Before graduating, each pupil will be required to construct a machine from drawings and patterns made by himself. A diploma will be given on graduation.

Adulterations in Butter.

When oleomargarine was first brought into public notice there was a good deal of opposition to its introduction, as affording the ready means of deceiving buyers, no matter how much better it might be than poor butter, how entirely harmless, and how thoroughly cleanly were the methods of its manufacture. Laws were therefore passed in several of the States prohibiting its manufacture and sale, only as all the packages should be distinctly branded with the name "oleomargarine." The farmers and dairymen were most anxious for this legislation. But since these laws were passed there has sprung up a large business in what is called "butterine," which usually consists of a little good creamery butter and an admixture of oleomargarine oil and neutral lard. The latter is simply lard with all taste removed, which increases its cost only about a cent a pound; but the butterine thus made is hardly distinguishable by the best judges from a fine creamery butter, under which designation a great deal of it is now coming to market. The winter is the best season for palming off this adulteration, as it does not keep as hard as genuine butter in the warm weather.

A London International Exhibition for 1884.

The Crystal Palace Company, of London, advertise the holding for six months, from April 3 next, of an "exhibition of arts, manufactures, and scientific, agricultural, and industrial products," and invite the participation of American exhibitors. The enterprise is in no way a government affair, but it is suggested that it will afford a valuable opportunity for American manufacturers, etc., to bring their productions before a wider circle of possible customers in the largest and wealthiest city in the world. A court in a central position on the main floor has been set aside for expected American contributions, and the ordinary charge for space is two shillings per square foot, with some exceptions both higher and lower.

Race between a Man and a Horse.

A 100 yard race lately took place at Echo Park, Philadelphia, between a Mustang pony and Frederick Rogers, of Trenton, for a purse of $200. The arrangement was to run fifty yards down the track and return. The track is about fifty feet wide, and Rogers depended on his chances to win by making a shorter turn than the pony. The horse ran down one side of the track and the man the other, each turning in opposite directions. A good start was made, and both man and horse reached the turning point at the same time. In wheeling around the horse became frightened and reared, the rider, in the confusion, dropping his whip. By the time the latter got under way on the home stretch Rogers was some distance ahead, and in the finish won by twenty yards.

The Organ Industry.

Mayor Beatty, of Washington, N. J., says he shipped 1,600 twenty-seven stop instruments during the month of November, this year, against 980 for the same month of last year. Mayor Beatty claims to have the largest organ trade in this country.

Helping Children to Write Compositions.

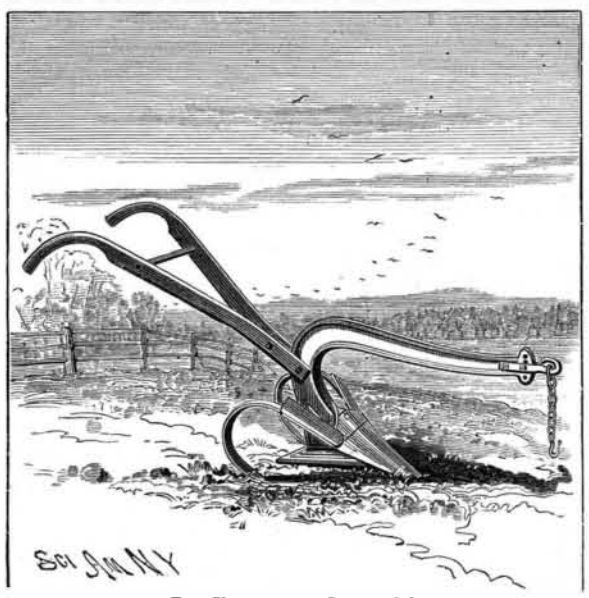
Every *paterfamilias* understands how difficult it is to get children to write their first "compositions." This is, for all ordinary children, the most irksome task of anything which comes up in the routine of school work, and every sort of device and makeshift is resorted to for evading the duty. What strikes us as a very pretty and ingenious idea for greatly lightening the labor of such work, if not making it an actual pleasure, has lately been made a feature of a New York publication, the *Pupil's Companion*. It consists of the presentation of attractive pictures, amusing or instructive, but such as cannot fail to catch a child's fancy, about which the teacher asks the child to write. Among those presented, one shows a child seated on the grass with a plate of soup in its lap, but the soup is being spilled and the child is crying in dismay because a toad has jumped on the plate; another is of a very pretty aquarium, which, besides its variety of fish, mosses, etc., has a fine show of water lilies and other plants; a third is of a bird's nest in the crotch of an old tree, the baby birds reaching out for the food which the parents are seen bringing to them, but underneath is a sign, put on by the proprietor of a farm house appearing near by, and which reads: "Furnished rooms to let—board, small family, no children." We do not believe most children of from six to twelve would count it a task to "write a story" on such subjects.

Luminous Jewels.

M. Gaston Trouve, the well known electrician of Paris, has lately designed a series of ornaments for ladies' wear consisting of glass, colored and cut to imitate rubies, diamonds, etc., fitted in an envolope, surrounding a small incandescent lamp of low resistance. The light shines through the pieces of glass only, and gives them all the appearance of the stone they are intended to imitate. The lamp is fed from a small battery, which is carried about the person. It is composed of three pairs of zinc carbon plates (two carbons to each zinc), or a larger number according to the current required. These plates dip in a saturated solution of bichromate of potash, which is contained in an ebonite cell with three compartments. The plates are fitted into a cover, which is kept securely down on the top of the cell by two bands of India rubber passed around the whole. Finally, the battery is incased in two sheets of gutta percha, so as to prevent any leakage. A miniature switch is carried in the pocket or elsewhere, within reach, to which the battery and lamp wires are connected. The pressure of a finger on the arm of this switch makes or breaks communication with the lamp. The battery weighs (with six plates) 300 grammes, and will work about thirty minutes with a lamp of from 2 to 3 volts. A larger battery, to work a 4 or 8 volt lamp, weighs 800 grammes.

SHOVEL PLOW.

The invention recently patented by Mr. Walden Eddy, and now being manufactured by W. Eddy & Sons, of Greenwich, New York, relates to winged shovel plows having spring teeth arranged to follow in the wake of the plow, on each side of it, and to work at a lower depth than the point of the plow, for loosening the ground laterally beyond the center of the row in which the plow works and nearer to the growing crop. These teeth are formed of flat bent bars, arranged to project laterally and backwardly in diverging directions from the under side of the mould board, and their rear ends are curved downwardly and bent so as to bring them in proper subsoiling position. The forward



EDDY'S SHOVEL PLOW.

portions of the teeth resting against the under side of the mould board are provided with two slots, one in the rear of the other. These slots are so shaped that the attachment may be widened or contracted, or made to run deeper or shallower at its points. The bolts passing through these slots to secure the spring teeth also hold the shovel point and wings to the mould board. In this way the construction is simplified and the mould board and wings are strengthened by the subsoiling attachment passing under them. By slackening the bolts the attachment may be adjusted as required when the bolts are tightened; or it may be easily removed from the plow when not needed. The engraving plainly shows the construction.

DEVICE FOR FASTENING SAW-CLAMPS, ETC., TO WORK-BENCHES.

In the accompanying engraving is a saw-clamp provided with a stationary jaw attached to the bar, *a*, and a removable jaw attached to the upper end of a lever, *f*, which is pivoted to the upper end of the arm, *d*. The lower end of the lever is bent upward to form a hook, and is engaged by a pin on a lever pivoted to the part, *d*, for locking the jaws closed or open. A block carrying the stud-pins, *c*, is arranged to slide in inclined ways (shown by the dotted lines) of arms of a saw-clamp projecting back over the top of the bench from the bar or frame, *a*, that is to be secured to the side of the bench. The ways are so pitched that the block will descend when drawn forward, and force the stud-pins into the top of the bench. It is moved by an elbow lever, *e*, so pivoted to the frame that down or back pressure on the lever will shift the block forward and engage the pins. The lever also

FASTENING SAW CLAMPS, ETC., TO WORK BENCHES.

serves to keep the block in place after being secured by swinging the pivot-joint, by which the rod, *b*, is connected to or below the line of the pivot attaching the lever to the arm, *d*. The bar, *a*, is also formed with stud-pins, *g*, which are at the same time forced into the side of the bench. This makes a simple and efficient device for connecting a saw-clamp to the bench, and it may be readily disconnected by raising the lever to thrust out the stud-pins. Vises and other tools may be as easily connected to the corners of work benches.

This invention has been patented by Mr. Augustus B. Coburn, of 1006 East 5th Street, Kansas City, Missouri.

Two Systems of Water Proofing.

They who have watched the growth of the textile industries for the last half century must have observed the gradually increasing demand for water proof fabrics. At first this demand manifested itself in the ready sale of coarse oiled goods for sailors' "dreadnaughts." Then in the elegant rubber lined material for the hunters' and the travelers' "Macintosh." Afterward in the cheap poncho, blanket, and overcoat, also rubber lined, and now in the "gossamer" for either sex. With hoods and without, as long, loose sacques, or as "Garricks," the number of them sold is greater than that of any other kind of outer garment. Generally worn as they are by throngs of pedestrians in rainy weather, they give as somber an appearance to our streets at the time as would be given by a series of processions of monks and nuns.

Unpleasant as the garments may be in the eyes of spectators, they are probably more so to the feelings of wearers. Impregnated with caoutchouc, gutta-percha, or drying oils, so as completely to close its pores, the fabric entirely arrests the vapors and gases arising from and accompanying the perspiration. Garments made of it are, when worn all day, not only disagreeable to the wearer, but unhealthful, and both on the ground of comfort and of personal hygiene the demand has arisen for a method of water proofing which shall not resist the passage of gases and vapors.

At first sight the invention of such a method would seem to be impracticable, but a little reflection recalled to the minds of manufacturers that there are many substances which water will not wet; which repel it when they are brought in contact with it. Such bodies, in scientific language, are said to be destitute of capillarity.

Familiar examples of this property are sometimes seen in several species of insects which dart over the surface of the still water of springs and brooks. Their feet, which are not moistened, are the centers of little circular depressions of the liquid surface, and seem to repel the water. In this case they exercise on the liquid, and receive in turn by reaction, a repulsive force, the extent of which is measured by the weight of the amount of liquid required to fill the depressions. In other words, the weight of the insect is exactly equal to the sum of the weights of the water required to fill the depressions produced by its feet.

Now if we immerse a tissue in a solution composed of

Gelatine	5 parts.
Soap	5 parts.
Alum	7 parts.
Water	170 parts.

we shall find, upon lifting and thoroughly drying the cloth, that we have communicated to the surface of each particular filament of which the stuff is composed the property of exercising on water a repulsive force similar to that of the feet of the insects above mentioned. Consequently, if upon the surface of the stuff water be thrown, it will not penetrate between the threads, it will be repelled; it will run over without passing through. The texture of the stuff has not been changed by the immersion in the aluminous bath, and gases and vapors can traverse it as before.

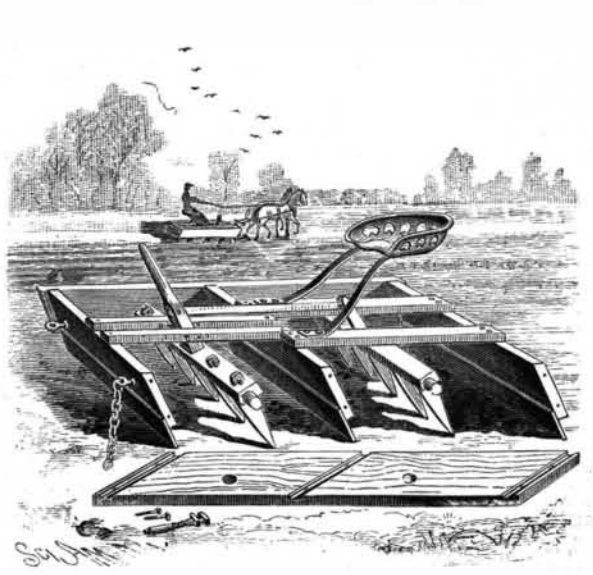
But the impermeability to water is not absolute. Theory and practice both show that under pressure, which varies with the nature of the tissue, it will allow water to penetrate. As water never collects upon our vestments in sufficient quantity to exert an appreciable pressure, little inconvenience is to be apprehended from this property. The new system of water-proofing based upon the principle of capillarity, although far from perfect, promises in time to prove a formidable competitor to the system now in general use. —*The Textile Record.*

Prosperity and Disaster.

According to an exchange, the failing of the Comstock mines brings hopeless ruin upon Virginia City. This place and Gold Hill, which is practically a part of the same town, had 35,000 inhabitants eight years ago; merchants with $1,000,000 capital, a score or more men worth from $300,000 to $30,000 000 each, private homes that cost $100,000, and hotels and everything else to match. Now there are but 5,000 inhabitants, nearly all miners and gamblers; the fine houses are all carried away or abandoned; real estate cannot be sold for the amount of the taxes; nothing can be sold which is not worth carrying away; and in a little time the gorgeous city must entirely disappear. There have been $285,000,000 worth of gold and silver taken from the Comstock mines, and this within a distance of half a mile.

FIELD DRAG.

The side boards of the machine are of any desired length, breadth, and thickness, and their forward ends are beveled upon the lower side and their rear ends upon the upper side. Inclined grooves are formed near their ends and at their centers, as shown in the detached side board in the engraving. Fitted in these grooves are cross boards, held by bolts passing through the side board and into nuts embedded near the ends of the cross boards. To the lower part of the forward sides of the cross boards are fastened steel plates projecting a little below the edge of the board to act upon the soil. Between the grooves in the side boards are holes to receive the journals formed upon the ends of cross bars, to which are attached, by suitable means, the shanks of steel knives, the rear set of knives being arranged to travel midway between the cuts made by the forward set. Levers are attached to the cross bars, the forward lever being longer than the rear one. To the upper end of the short lever is pivoted one end of a connecting rod, the other end of which is pivoted to the middle part of the long lever, so that the two sets of knives can be adjusted to work at any desired depth in the ground and can be raised above the ground. The knives may be held in place by a chain attached to the long lever and hooked upon a pin fastened to the cross board



HILL'S FIELD DRAG.

in the rear of the lever. Or the long lever may pass between two parallel bars having holes in which a pin is inserted as shown in the engraving. To the forward cross board or to the forward ends of the side boards are eyebolts to receive the draught. The driver's seat may be arranged as shown. When the machine is drawn over the ground the forward scraper partially levels the soil so that the forward set of knives cuts it into pieces; the center scraper further packs and levels it, and the other knives cut it into smaller pieces, while the rear scraper leaves it in good condition for the planter or seed drill.

This invention has been patented by Mr. Daniel Hill, of New Vienna, Ohio.