

IMPROVED WINDMILL.

In the windmill shown in the accompanying engraving, the wheel converts the power of the wind into available power and requires no vane to keep it properly faced toward the wind. The construction of the wheel is peculiar and well calculated for constant use.

The wings, of iron, are secured at their outer ends to a wide iron hoop, and the shaft to which the wheel is attached is supported in an inclined position by two conical rollers, which are placed on opposite sides of the spherical bearing, which keeps the shaft in place. The conical rollers bear on opposite sides of an annular plate, supported by the enlarged upper end of the vertical shaft of the mill.

As the wheel is revolved by the pressure of the wind, the conical rollers impart motion to the vertical shaft, by rolling on the annular plate, and the wheel will automatically face itself to the wind, whatever its direction.

The motion of the upper part of the vertical shaft is communicated to the lower portion through a friction clutch, operated by a centrifugal arrangement something like a centrifugal ball governor. The levers to which the balls are attached are carried by the upper part of the shaft, and press the sides of a cone on the upper end of the lower portion of the shaft. When the action of the wheel is normal, the levers of the regulating apparatus press the cone, and the lower portion of the shaft is driven with the same speed as the upper portion; but when the speed of the wheel increases, the balls rise by centrifugal force, and the lower portion of the shaft is released, while the upper part of the mill may revolve at any rate of speed without endangering it or the machinery below.

The centrifugal apparatus is provided with means by which it may be made to preserve the connection between the two parts of the shaft, when the speed of the wheel is above the normal.

This mill is very simple in its construction, and may be built and kept in order at a comparatively small expense. Further information in regard to it may be obtained by addressing the inventor, Mr. David A. Smith, of Greencastle, Pa.

A Home-made Telephone.

The *American Farmer* gives the following directions for making a cheap home-made telephone:

To make a good and serviceable telephone, good from one farm house to another, only requires enough wire and two cigar boxes. First select your boxes, and make a hole about a half an inch in diameter in the center of the bottom of each, and then place one in each of the houses you wish to connect; then get five pounds of common iron stove pipe wire, make a loop in one end and put it through the hole in your cigar box and fasten it with a nail; then draw it tight to the other box, supporting it when necessary with a stout cord. You can easily run your line into the house by boring a hole through the glass. Support your boxes with slats nailed across the window, and your telephone is complete. The writer has one that is 200 yards long and cost forty-fivements that will carry music when the organ is played thirty feet away in another room.

Callaud's Sulphate of Copper Battery.

L'Electrician says: In this battery, made by Messrs. Dumoulin and Froment, the sulphate of copper is placed in a glass jar, in the bottom of which there are two holes. By this arrangement the sulphate of copper can easily be removed, and the liquid be more or less stirred up, without bringing the solution in immediate contact with the zinc. The piercing of the two holes can be easily done, and at very little cost.

The positive pole is formed by a copper wire, rolled in the shape of a spiral at its lower end, and consequently is without weld, solder, or any possible break in its continuity. A protection of rubber, sufficiently thick, formed by a simple tube slipped over the end of the copper wire, covers it from the bottom to outside the outer jar. The zinc is suspended by two hooks, which are simply passed through two holes made in the top of the jar, and which rest on the edge of the outer jar.

This battery has one peculiarity which can be of a certain use as regards attending to it—namely, the difference generally noticed between the level of the liquid inside and outside of the glass jar. If the battery is in good condition, the liquid in the jar is lower than that with the zinc, thus showing that the solution of sulphate of copper is concentrated, or nearly so, and that of zinc sulphate is not so; this case proves the battery to be in good working condition. If, on the contrary, the heights of the liquids are equal, or even if the sulphate of copper should be higher than the other, it is because the copper solution is not concentrated enough, or that the sulphate of zinc solution is overcharged with salt.

The constants of the battery thus made do not differ at all from those of the ordinary callaud (E —about 1 volt, R —6 to 8 ohms), because the positive pole is always kept in the solution of sulphate of copper, which escapes from the jar through the two holes.

Mitchell's Atlas of the World.

This is a well known standard book, large quarto pages, containing maps of the various countries of the world, in all 147 maps and plans, embracing, especially, most excellent maps of the United States. The maps are printed from copper plates, and the nomenclature is clear and good, the whole finished and colored in admirable style. Plans of the principal cities are also given; together with valuable tables, showing population, post offices, etc. This book forms one of the most useful and convenient works for general refer-

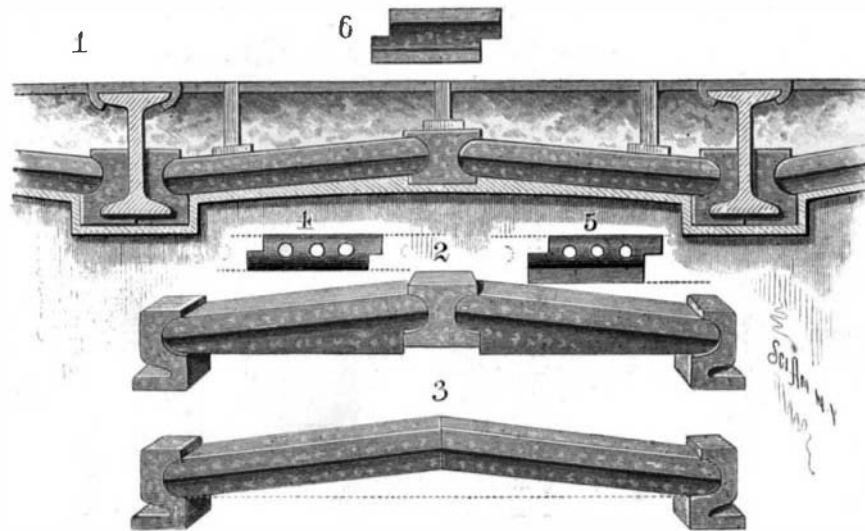
**SMITH'S IMPROVED WINDMILL.**

ence, and should have a place in every business establishment and in every household. Mr. P. O. Smith is the general agent for the work, headquarters at the Cosmopolitan Hotel, New York.

FIREPROOF FLOOR AND CEILING.

We give an engraving of one of the latest and best forms of filling for fireproof structures, which consists of buttresses planted against the beams resting on the lower flanges and extending partly across the lower edge of the beam, and struts which with a central or key piece form a toggle arch between the beams. The engraving shows three forms of this filling.

In Fig. 1 the struts are flat, with rounded ends fitting in

**NEW FIREPROOF FLOOR AND CEILING.**

corresponding bearings in the buttresses and in the key piece. The device shown in Fig. 2 is nearly the same, the only difference being the horizontal face on the under surface of the arch. Fig. 3 shows an arch in which the key is dispensed with, the struts abutting in the middle. Fig. 4 is an end view of the strut shown in Fig. 1; and Fig. 5 shows the inner end of the strut shown in Fig. 2. Fig. 6 is a side view of the key piece.

The floor is laid on strips placed on the struts or buttress blocks and key, and the spaces between its strips and above the struts are filled with concrete. The under face of the arch is finished in any desirable way. The great advantage

of this system is that the arch can be placed without the use of scaffold or stages of any kind, thus greatly cheapening the construction. A pair of buttresses and a pair of struts with the key are placed, then other buttresses are placed on the beams, and another pair of struts placed in position with their ends resting on the buttress and on the rebate and key projecting from the first pair of struts, the buttresses being arranged to break joints with the struts. Another pair of buttresses is now inserted, then another pair of struts placed, and so on. This filling adjusts itself automatically to its bearings, and is strong and well calculated to perfectly insulate one floor from the effects of heat in another. To make the filling as light as possible without impairing its strength, it is apertured lengthwise.

This device is the invention of Mr. Andrew J. Campbell, of 552 to 558 W. 33d St., New York city.

Water Rights Maintained.

In a suit recently brought in Rhode Island by one manufacturing company to restrain another manufacturing company located on a stream above the first, to prevent the polluting of the stream with dyestuffs, chemicals, etc. The court granted an injunction.

Judge Potter, in the opinion, said: "Every owner of land has the right to have the water which passes his land come to it in its pure, natural state. The offending company here contends that while this might be very good law in former days for an agricultural people who used the water for washing, drinking, and watering animals, there has been a complete change of circumstances; that we are largely interested in manufactures; and the wealth of the State depends mainly on their prosperity, and that the more valuable use should prevail. The right of the riparian owner, farmer, or mill owner, to have the water pass his land in its natural state and to a use of it to any extent which shall not injure it for the use of others, is as much his property as the land itself. This court cannot alter the law, neither can the Legislature itself take the right away any more than it can take its land. If needed for the public use, the State can take this right on making compensation, but it cannot be taken from one man and given to another even if he pays for it; that must be left to private agreement."

Water Supply for Cities and Towns.

At a recent meeting of the American Society of Civil Engineers, in this city, the supply of water for cities and towns, from subterranean sources, or ground water, as developed in the United States since 1870, was described by Mr. J. J. R. Croes, C.E. It was at first supposed that such supply could be obtained by filtration of river or lake water through the gravel of its banks. It was discovered, however, that in fact much more water came from the land side than from the river, and that wherever such a source of supply is successful, the water really comes from the underground reservoirs or streams which are found generally in all valleys containing much gravel.

The wells, galleries, and basins constructed in various places were described, and their success or failure indicated. It was stated that experience was generally against the construction of open galleries or canals, on account of the vegetable growth which always occurred in such cases.

Screw in Tunnel.

The Lightning, one of the earliest torpedo boats supplied by Messrs. Thornycroft to the British service, has been lately subjected to a series of progressive speed trials at Portsmouth, under the superintendence of Chief Engineer Castle, of the Steam Reserve. The steering power of the craft, which is otherwise satisfactory, has always proved defective in consequence of the wide circle which she required to turn in. In order to surmount the difficulty the propeller has recently been incased in a tunnel; but while it was thought that the device might improve her handiness in going round, it was feared that might detract from her speed. Trials were accordingly ordered to be made upon the measured mile in Stokes Bay, for purposes of comparison with the speed which she realized with the original propeller. Four runs were made at full speed, 14 knots, 12 knots, and 10 knots. When tested to the utmost a mean speed of 16.5 knots was obtained, or about half a knot less than under the old conditions. The horse power developed, however, was also less, and as this is supposed to be due partly to the inferior character of the coal used, and partly to the fuel being forced over the bridge and so choking some of the boiler tubes, it is probable that further runs will be ordered. The steering in circling and going ahead was better than before, but in steering with the engine going astern the results were less satisfactory than with an open screw.

In France in 1881 there were more than a million residents of foreign birth, chiefly Belgians, Germans, Swiss, and Italians. England, with 27,000,000, has only 140,000 foreigners; Germany, with 45,000,000, only 270,000; while France, with 37,400,000, has 1,000,000.

The Paper Dummy Patent Invalid.

Fifteen years ago the Patent Office granted a patent to Brock for dress dummies made of papier mache, intended to take the place of the wire frames used for exhibiting dresses, clothing, etc. The improved dummies being smooth, made the dresses and clothes look better. This has proved to be a most valuable patent; the owners were making lots of money out of it, and did not relish the idea of having anybody interfere with their rights. So they brought suit against several infringing parties, and the case was decided not long ago by Judge Wallace, in the United States Circuit Court, adversely to the patent. He holds that the patent is invalid, because paper dummies were used in making up wax figures prior to the grant of the patent. Inasmuch as the wire dummies did not contain the paper or papier mache shell, and the lay figures did not contain head piece, shaft braces, or base of the patented device, they were not anticipations of it. The proofs show that the patented dummy has commended itself to the public interested in such devices. It is a better model of the human figure, and because of the continuous surface of the shell clothing can be made to fit more accurately upon it than upon the interstitial frame or shell of the

wire dummy; but the patent cannot be sustained because the device is destitute of patentable novelty. If the substitution of the paper or papier mache for the wire of the shell or frame was obviously practicable, the patentee was not an inventor. If mechanics skilled in the particular department of construction could have seen at a glance the feasibility of the change, then, although the device may have been mechanically new, it was not intellectually novel. The paper which was substituted for the wire had been used to make the shell of a figure in imitation of the human body, and the figures in which it was thus used had been employed for displaying clothing. The displaying of clothing was not the primary purpose for which these lay figures were intended; but that use was not only suggested, but was very obviously one of the ends in view. Not only, therefore, had the material that the patentee substituted for the wire been employed, as he employed it, to make the shell or frame of a figure resembling the human body, but it had also been applied to perform the same office. The new application of an old material to a cognate use will not generally support a patent, but here it was employed in the same use. The bill in the several cases was dismissed.

Large Freight Steamer.

The new freight steamer City of Fall River, of the Fall River Line, which made her first trip recently, is the largest freight steamer in the country. Her capacity equals the combined capacity of the Bristol and the Providence. It is asserted that in her design and build, in propelling power, and other essential features she is a new departure in steamboat building. Her hull, built at Chelsea, Mass., is of oak and hackmatack, with oak plankings, clamps, and stringers. Her dimensions are 273 feet over all, 42 feet 4 inches beam, 17 feet of hold, and she registers 2,533 gross tons. She has three watertight bulkheads. Her machinery was constructed at the North River Iron Works. The engine is a compound vertical beam engine, with surface condenser. The two cylinders, 68 inches and 44 inches in diameter, are so arranged that either can be used alone. The boilers are of steel, one-half inch thick, with a tested pressure of 150 pounds per square inch, although her working pressure is intended to be but 80 pounds.

She has feathering paddle wheels, invented about fifty years ago, but not generally used except in Southern waters. They are 25 feet 6 inches in diameter, and there are twelve paddles to each wheel. Her speed on her trial trip was 17.3 knots per hour and her average speed in all kinds of weather, it is claimed, will be not less than 15.9 knots an hour. The estimated cost of the steamer is \$350,000. She is commanded by Captain Thomas Collins.

THE Cincinnati Price Current estimates that a year ago a barrel of pork was equal in value to 2 7/8 barrels of family flour, while at present prices it is the equivalent of 3 3/8 barrels. That is, pork is now twenty-five per cent higher, as compared with flour, than a year ago. When meat is high and bread low, more bread and less meat will be eaten. At a very low estimate the increase in flour consumption in this country alone, thus produced, is equivalent to over ten million bushels for the current year.

IMPROVEMENT IN CUTTER HEADS.

We give engravings of several forms of improved cutters and cutter heads, used in matching, moulding, and other wood working machines. These heads possess many advantages over the old fashioned heads having movable bits, among which are, the facility with which they may be adjusted, and the certainty of always having them accurately in position, the uniformity of the work done by them, and their freedom from the danger of the cutters flying from the machine.

These heads within five years have found their way into almost every mill in the country, upon their own merits. The cutters in the tongue are arranged in two series, viz., upper and lower cutters, which cut alternately, each pair



Fig. 1.—TONGUE HEAD

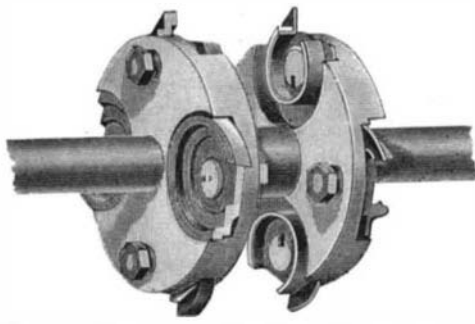


Fig. 2.—HEADS FOR BOX BOARD MATCHING.

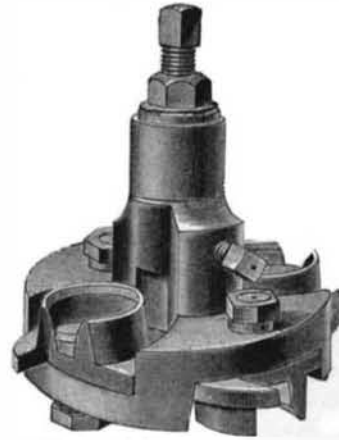


Fig. 3.—GROOVE HEAD.

completing a full cut across the edge of the lumber—producing either tongue or groove. A second peculiarity, and one of great importance, is that of slanting the cutters, by securing them to seats alternately arranged and alternately inclined, thus giving the clearance at the side, so that no part of the cutter comes in contact with the lumber but the cutting edge; this insures light and easy running.

Fig. 4 shows the position of one of the cutters and side clearance when in the cut, and the outline of the cutter that is to follow and complete the full pattern. The engraving shows the latest improvements in the placement of two of the cutters below and two above the flange, thus adapting the heads to any expansion or change of tongue and groove.

The amount of service one set of these cutters will render is very great, the outer circle measuring from 4 1/2 to 7 inches, all of which is tool cutting edge, and being fastened upon their centers, are, as they wear away, brought around until the entire circle is used up.

The cutter is held by bolt and nut, which when drawn up cannot move the cutter, as the parts in contact therewith are stationary, the bolt being slotted to fit a key in the head. The cutters thus fastened are secured to their seats on their large, flat sides, and work through the hardest knots and at the fastest feed without moving. The knife edges of the cutters are slanted to produce a draw cut, and will not chip up or break out knots. The chip started at the tongue is cut outward, while the groove cutters start the chip at the outer edge of the board and cut inward, leaving the corners full

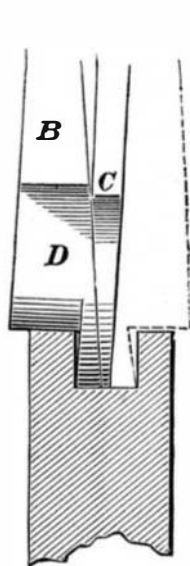
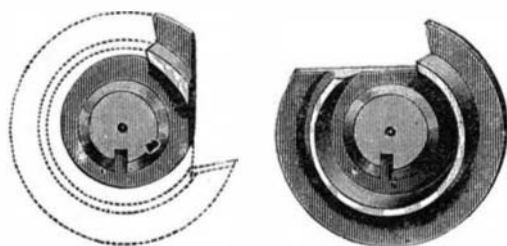


Fig. 4



CUTTER NEARLY USED UP. A NEW CUTTER.

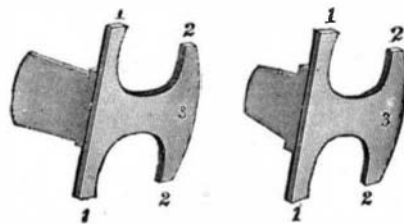


Fig. 5.

GAUGE FOR TONGUE HEAD. GAUGE FOR GROOVE HEAD.

and free from checks, the points of the cutters working the offset having the lead, thus producing a tongue and groove of a uniform size and shape that will always fit.

Each head is furnished with a gauge (Fig. 5) for setting the cutters, carefully fitted to their slanted edges, showing the angle at which to file them; keep the cutters fitted thereto, and the head will remain full size. The arms, 1, 1, fit over the round part of the nut that holds the bit. The arms, 2, 2, will pass down by the side of the head, and the point, 3, will rest on the outer circle of the head. With the gauge in this position, the face of bit must fit up against the face of gauge.

Fig. 2 represents a set of matching heads, applied to mandrels for matching box boards. They make a neat, clean joint, as shown in Fig. 6. These heads are made in a

variety of other forms for moulding, for sash, for ship laps, jointing, and so on. Further particulars in regard to this useful invention may be obtained by addressing Messrs. Shimer & Company, Milton, Pa.

Flint Lock Guns.

One of the most important of Birmingham industries is the gun trade. A very large number of shot guns go to America from here every year. Many fine fowling pieces are included, but still most of the guns are of a very cheap kind. A strange branch of the gun business here, says Consul King, is the manufacture of guns for the east and west coasts of Africa. These weapons are still made in great numbers, and usually have very long bright barrels and old fashioned flint locks. It seems that the natives of the African coasts and interior prefer flint to percussion locks, because of the difficulty of procuring caps. The guns for this trade are very cheap, some selling as low as five or six shillings apiece at wholesale; but every barrel has to be tested at the government proof house, the same as if intended for the finest of hammerless breech-loaders.

Panic.

The *Lancet* says it is not much use asserting that assemblies of sane persons ought not to become victims of panic, but, in truth, unless the nervous system of man could be reconstructed on a principle which would necessarily deprive it of some of its most excellent qualities, it is impossible that there will not always be a tendency to impart and receive this impression, which so powerfully affects the mind and body that judgment is for the time suspended, and the limbs either refuse to act or act impulsively or under the control of the emotional part of the being. Discipline is the only remedy for a tendency to panic. What is needed to cure the tendency to panics in assemblies is the discipline of crowds.

Inventors and Inventions.

Invention is, in every instance, says Mr. Edward Gibbon Swann in a recent address in London, the result of two things: first, of the sagacity which has discerned a want; secondly, of the resolute effort to supply that want, whether it be to obviate or overcome an existing difficulty or to furnish a totally new condition to certain phases of life or of industry. "Necessity is the mother of invention," in the broad sense of the axiom. It is not, in all instances, so as regards individual examples. It has frequently happened that important inventions have been brought about by what we might call the *hobbies of leisure*. Nevertheless, there is always a far greater probability (and consequently a greater frequency of occurrence) that a naturally ingenious person with a practical insight into certain particular applications of skill—but goaded by the need and perhaps the sufferings of his surroundings and himself—finds his only solace in the elaboration of an idea, and that that idea finds expression in the solution of some problem, whether scientific or purely mechanical, or both. In fact, he blossoms into an inventor, and yields seed in an invention.

General Wolseley on Alcohol.

Replying to a deputation of the Blackburn Temperance Mission at the residence of Major-General Fielden on the 18th instant, he said that he had always employed the opportunities afforded him to impress the necessity of temperance on those under his command. In the Red River expedition, against the advice even of the medical men who accompanied the troops, he decided that no spirituous liquors should be taken with the force; and yet no men ever did harder work or behaved better than those on that expedition. In South Africa his personal body guard consisted almost exclusively of temperance men; and there too the doctors, who had predicted all manner of ills from the absence of grog, had absolutely nothing to do. In Egypt, again, the doctors told him that it was very necessary the men should have grog, and he was obliged, owing to the great pressure put on him, to allow it occasionally; but it was given in very small quantities and rarely, and yet the troops in Egypt were admirable in their behavior. He had long held that drink was the great source of crime, disobedience, and other evils in the army.

SILK production is said to be in the following proportions: Italy, 37 per cent; China, 36; France, 8; East India (Bengal), 7; Japan, 6; Spain, 2; Persia and the Levant, 4.