HOW WE STAND AND WALK.

[Abstract of a Lecture Delivered before the American Institute by Prof. Burt G. Wilder.]

The second of the course of scientific lectures before the American Institute was delivered on the evening of Dec. 27, by Prof. Burt G. Wilder, of the Cornell University. The lecture was illustrated by diagrams and experiments.

After a somewhat humorous introduction the lecturer contrasted the walking of men with that of brutes. He said:

You will notice in menageries that the tallest apes are obliged to walk upon their feet as we should walk upon the hands, with the great toe standing out from the side of the foot, and the heel so short that it has not the power of supporting the body that our heel has. Here is a diagram of the skeleton of the foot of a man, and you see that the heel is long and strong; that the bones forming the arch of the foot are strongly put together. The great toe is the essential part of the foot in standing and in walking. If any of us have lost our great toes we should find immediately how difficult it is to balance ourselves upon our feet, because with man the use of the great toe lies in the propulsion of the body upon the feet, whereas in the gorilla the great toe stands out from the side of the foot like a thumb, and has no power whatever of supporting the body or propelling it like the man.

Du Chaillu tells wonderful stories of the grasping power of this hind hand of the ape, in which respect man's foot bears no comparison to it. Now, again, if you wish to see man at a disadvantage you have only to place him on all-fours, and make him walk like an ape. (The lecturer then made a diagram of a man in this position, which provoked considerable amusement). The head now hangs forwards as a great weight, requiring muscles which we do not possess to support it. The curve in the back, and the limbs are so arranged that the knee itself touches the ground, our thighs being much longer than the corresponding bones in the upper arm; and we have to raise the thighs so that the feet may touch the ground. You must not, however, forget that there was a time when we all went in this way or attempted to do so.

I cannot help here alluding to one thing, although, God be thanked! the necessity for it has almost passed out of date—the fact that some among the human race who have considered themselves even most refined and civilized, have, for various reasons and by various means, imitated some of the lower animals in their attitudes. If you were here to draw a human head and face with small jaws like this (exhibiting a head), and put on the back of it a great chignon, we should have simply the belle of the period in the position which she is obliged, by the very force of gravity, to assume in order to support this ponderous mass upon the back of her head. There is an old saying that "one good turn deserves another." I should change it in this case by saying that "one ill bend provokes another." In this Nineteenth century we have adopted what was originally the monkey bend, and not a Grecian or any other kind of bend.

There are several things to be said respecting the human foot, which is, of all the parts of the body, the least noticed. It is covered up, and not exposed at all times, like the hands. It has a degrading office, inasmuch as it is obliged to support the entire body upon it, and yet there are many things in the foot well worthy of our consideration. (Diagram of a foot, showing the way the bones are joined to form the arch, was exhibited, and the manner in which the body is supported was described). Now, in order that we should stand, it is necessary not merely that we shall be put up in an erect position—I might manufacture a pole representing a man, and set it upright, but how long do you suppose it would maintain its position? Not at all. It would topple over.

We do not realize the attention which is required of the mind to enable us to stand upright; yet there is a constant, although unconscious, attention of the brain, without which we could not maintain an erect attitude. And the muscles which lie along the legs, and which may be seen in the diagram, are in constant action. If you will stand on tiptoe, and let a person feel the muscles of the leg, they will be found in constant activity. There is a movement among them; some are falling backwards and some forwards, yet all are so adapted to each other that we are enabled to stand upright.

When we wish to lift ourselves upon tiptoe, then those muscles which are attached here (at the heel) contract with greater force. In ballet dancers and tight-rope walkers there is an immense development of the muscles of the calf, and indeed of the entire leg. The muscles attached to the end of the heel contract, the foot itself resting upon the ground, and form a lever of the second kind, as it is called, thus hoisting the body upon the toe; and the muscles which are required to keep the body on tiptoe are more than we dare enumerate almost.

Man's foot is called a plantigrade foot; that is, a foot which has the whole sole flat upon the earth. There is one other beast—and a very respectable one in his way, which has also a plantigrade foot, and that is the bear; but the bear's foot and method of using it differ from man's, and his method of using it, in this respect—that whereas as we walk we strike first the heel, and then roll forward upon the toe of each foot alternately, the bear lifts the whole of the foot together and puts it down flat, in precisely the same way that a negro clog dancer does. The bear has not the power to put down his heel first and then roll forward and give a spring as we do, but it puts it down flat, as any one of us would if we had a wooden leg. So that there is a difference both in the structure, and method of using, this useful member.

This brings us now to the subject of walking itself, which is properly the subject of the present lecture. I might take it up from half a dozen different points of view. After thinking the matter over I have concluded to approach it with reference, first, to a single familiar idea—the influence which walking, or which standing in different positions, has upon the hight of the body. There are three groups of facts which may be adduced in order to show that the hight of the body is affected to some extent during our walking and different modes of standing. One is the matter of common observation that we are shorter when standing upon one foot than when standing upon both.

[The lecturer's assistant at this point stood up beside a board, and his hight, standing first upon both feet and then upon one, was measured. Unfortunately for the theory, however, the man's altitude remained the same in both positions, a fact which brought smiles to the faces of the audience.] "I shall have to say, continued the Professor, " with a gentleman more distinguished than I can ever hope to be, who, when a certain experiment of his failed utterly, very coolly turned to his hearers and said: "Gentlemen, the experiment has failed, but the principle remains the same." [Laughter.]

The second matter in connection with this is stated by ladies—certainly good authorities in this day and generation —who say that the skirts of dresses which exactly clear the ground while the person is standing still, will, the instant they begin to walk, drag upon the earth; and in the third place, Dr. Oliver Wendell Holmes, who has written some upon this subject, has stated that a man is shorter when he walks than when standing erect. I have tried the experiment over and over again, and I am convinced that at every single point in ordinary walking a man is shorter than when standing still.

There is a certain average length of a man's body, and this length may be defined as the distance between two parallel planes which coincide respectively with his uppermost and lowermost points. But there is some difference between the length of the body and the hight. The length varies under certain conditions, and the first is that a man is taller when he takes a full breath than when he has his lungs empty. [This fact was practically demonstrated by the lecturer.] The second is that a man is shorter when he stands than when he is lying down flat upon his back. [The Professor's assistant laid down, and in that position measured five feet and eight inches; standing up, and carefully measured, it was shown that he was an inch shorter.] This difference is for the reason that when we are lying down, the whole body is allowed to stretch itself out, while in standing it settles down, so to speak. From the same cause comes the familiar fact that a man is taller in the morning than at night after he goes to bed. He loses, perhaps, an inch in the daytime. One other thing I will not stop to prove, and that is, that any deflection of the body from the perpendicular lessens the length of the body. We can prove that a man's body is shorter when it is bent. For instance, when we bend the body at the hips and spread the legs to any extent, or when we bend the knees, we become shorter. The hight of a body may be less, and yet its length be exactly the same.

In stating the phenomena of walking we have to consider two things—first, whether different parts of the body are bent upon each other when walking, and second, whether the body is swung from one side to the other. We shall find that both of these occur in every stage of walking. The walking man is peculiar in this respect, that the center of gravity is constantly shifted from one side to the other, and at the same time propelled forward. It is oscillated from side to side, and at the same time it performs a forward movement in the direction in which the person is going. Now this transfer of the center of gravity gives us that oscillation of the body which you see in very tall or stout persons when walking behind them. The leg of a giant is to the leg of a dwarf as is the pendulum of a large clock to that of a mantel clock. In the short man it swings more rapidly, in the tall man more slowly. The body is carried forward steadily, but the legs are not.

The lecturer then exhibited a gradigraph, a simple apparatus consisting of two hollow tin tubes placed so as to form a right-angle triangle, each tube containing a wooden piston resting on a spring, and having attached to the outer end a piece of charcoal. By means of this instrument he showed the variation in hight of a person while walking, and also the oscillation of the body from side to side. "I do not," said he, "claim for this instrument any wonderful powers, but it is, I think, possible by this means to get a more exact idea of the gaits of different nations. It would certainly be easy to recognize a gait having any distinct characteristics, as, for instance, a stage stride. We know that the French walk different from the Prussian, and the Prussian from the English. It is possible that this instrument may yet be perfected so as to measure the exact amount of oscillation upward and downward and from side to side. One very curious fact in regard to walking is that one side of the body always tends to outwalk the other side. It is not possible, when the eyes are shut, to walk in a straight line for any length of time. We have heard stories of persons losing their way in woods and on prairies, and coming out so as to indicate that they had been walking nearly in a circle. I have myself tried experiments in a large room, and have found on looking at a crack in the floor and closing the eyes, that it was impossible to keep that crack. I almost always turned to the right; and it will be found, when persons lose their way, that they almost invariably wander off to the right rather than the left.

IT it estimated that there are at present in this city out of employment, 1,000 bricklayers and masons, 400 stair-builders, and 800 painters.

MANUFACTURE OF SAWS IN SHEFFIELD.

[Condensed from The Ironmonger.]

We were first taken into the rolling mill, in order to witness the manufacturing process from its beginning, and we must confess we were at first rather startled by the sight which met our unaccustomed eyes, and by the sounds with which our ears were greeted. From every side, while red-hot metal was being thrown about in every direction, sounded the loud whirring of rolls, creaking of engines, snicking of shears, rumbling of wheels, and roaring of furnaces. Men stripped to their shirts, with perspiration starting from every pore, were busily employed in rolling ingots of steel, which are cast on the premises into sheets, bars, rods, etc.; but we at present have only to do with the sheets. Accordingly our conductor led us to a furnace of moderate dimensions, from which the furnace man took a red or rather white-hot ingot. We may here remark, that the ingots which are used for sheet rolling are of different shapes and dimensions, according to the size and description of saw they are intended to produce. The ingot having been taken from the furnace, is handed to the roller (we mean the man, not the rolling apparatus), who passes it between the rolls, it being received on the opposite side by another workman called the backer, and being by him repassed to the roller. After passing and repassing between the rolls several times, the ingot is transformed into a sheet of steel, the degree of thickness being determined by a gage, which the roller carries with him; he, however, seldom uses the gage, as long practice has enabled him to determine to a nicety the degree of thickness to which the ingot is to be rolled. We may here remark that the handling above spoken of is performed by tongs of a peculiar description, great dexterity being required in the use of these tongs, in order to prevent the sheet of steel slipping from the nippers.

The next operation which the sheet underwent was that of paring, which is simply the cutting, by means of a pair of shears worked by steam power, the sheet of steel into the shape and size required. In this case the sheet under operation was intended for an ordinary carpenter's or hand-saw. Toothing is the next operation, and is performed with more ease and celerity than would be imagined. The workman is seated on a high stool before a table or counter, and, by means of a small fly, strikes out the cogs, or teeth of the saw, with great rapidity. The saw he acted upon for our information contained about 115 teeth, and it will scarcely be believed that this number of teeth were made in the space of less than two minutes. The tooth-cutter informed us, in reply to a few questions which we put to him, that he could cut as many as twenty-four dozen of ordinary-sized hand-saws (say twenty-four inches long) in a day, the day consisting of about eight hours.

Hardening and tempering of the saw is the next process. For this purpose a large oven is built over a furnace, which being surrounded in every direction by fire, is continually in a state of red heat. Into this oven the saw is introduced, and when red hot is taken out and plunged into a tank or bath containing oil. After remaining in this bath for a few minutes, it is taken out, and by this process the saw is made hard, or, we would say, stiff. The saw becoming very bent, and out of shape by this process, it is necessary to smith it, or reduce it to its proper shape. But as in the process of hardening the saw has become very brittle, it is necessary to draw the temper, in order to allow of its being smithed or straightened without danger of breaking.

The next process which the saw undergoes is that of grinding. This is not, as might be supposed, for the purpose of sharpening the edge of the saw; it is done in order to take off the rough and dull looking surface, and give it a bright and highly polished appearance.

The grinding room is simply the shed or building within which the grindstones are placed. The grinding is performed by a grinder standing or sitting upon a horse (the block of wood placed at the back of the grindstones, upon which the workman stands or sits) and pressing the saw with all his weight and strength upon the grindstone. We must confess that we were agreeably surprised by the appearance of the saw-grinders, they being, we thought, remarkably mild and inoffensive-looking men, and exhibiting none of those signs of brutal ferocity which we had almost expected to find among the associates of the notorious Broadhead and Crookes, of saw-grinders' trade-union celebrity. We noticed one thing with reference to the vocation of the saw grinders, which was that their work must, to say the least of it, be very disagreeable in cold weather, owing to the continuous stream of water that is pouring over their hands, our readers being, no doubt, aware that cold water is always flowing over the grindstones in order to neutralize the friction proceeding from the contact of the steel with the stone. The grinders, we are sorry to say, labor under the disadvantage of great danger in their work—apart from the danger which is always threatening them—and which cannot always be effectually guarded against, of the grindstones flying or breaking, thereby perhaps killing or seriously injuring all or a great number of the men in the grinding room, the men knowing that they are inhaling poison, and consequently death, with every breath they take, the particles of steel and of stone entering into their lungs, and sending them off the face of the earth, at, in many cases, a premature age. This being the case with the wet grinders, how then must it be with the dry grinders, who have not the advantage which the others enjoy of having many of the deadly particles taken off by the water? Besides this, in the case of the wet grinders the stone rotates *from* the workman, in the case of the dry grinders, the stone rotates in the opposite direction, that is to say *full in their faces*. We left the grinding wheel with feelings saddened by the reflection that the fine-looking young men we had just seen employed, in full vigor of their youth and strength, were dying by inches.

The glazing or polishing room was the department next visited, and our saw was handed to a workman, who immediately proceeded to glaze and polish it. This he did by passing the saw over a wheel, in the same manner as the grinder had done. The wheel is made of very hard wood, and is placed in front of a stand or horse, upon which the operator stands with his feet resting upon a description of stirrup, the workman being, in fact, in the same position as the wet grinder. The wooden wheel being painted with a glutinous substance, is covered with emery.

The saw is next taken to the finishing room. Here at a long table sat two or three females at work varnishing the saw handles, while at different benches men were cutting the handles out of planks of wood. We may as well remark here that the handles are made of several kinds of wood, common saws bearing beech-wood handles, and the best saws generally having handles made of ebony or mahogany. The saw-handle maker taking a plank of beech wood, marked with a pencil six or eight handles upon the wood, he next with a small saw divided the wood into as many blocks, and gradually, and with great care, cut these blocks, by aid of the small saw, into the shape of saw handles; he then with a file, filed every portion of the handle down to smoothness, and passing it over to a woman who sat at the varnish table, she covered it by means of a small brush with varnish. The handle being then placed on a rack with a number of others, was left to get dry.

Sewage Purification.

During the past twelve months a series of experiments has been carried on at the Ealing Sewage Works to test the system there adopted for the purification of the sewage of Ealing. These experiments have been carried out by Mr. Jones, the local surveyor, under the superintendence of Professor Way, who, after paying more than thirty visits, has drawn up a most favorable report, which was published by the Local Board authorities on Saturday last. The sewage of Ealing is dealt with by means of filter beds, of which the Professor thus speaks: "These filter beds are, in my opinion, of very great importance in carrying out any process of purificatien of the sewage previous to its discharge into the Thames. Without them it would be impossible, by the best precipitants known, to clarify the sewage in the tank, for no matter how perfect the system of precipitation may be, there is always some portion of flocculent matter which will not settle, and which can only be removed by filtration. These filter beds are an excellent feature of the Ealing Sewage Works." Speaking of the use of chemicals to precipitate the sewage, the Professor says: "Several years since I expressed the opinion that if to the system of filtration that of previous precipitation were added, the Ealing works would be among the most perfect, if not the most perfect, of their kind in the country. I have seen nothing recently to alter that opinion. The precipitants employed are lime and a cheap salt of iron, the latter made on the premises by a process suggested by myself. With the lime is used a preparation of tar, but the chief effect in the clarification of the sewage is undeniably due to the lime and the iron salt. Slaked lime is mixed with water and the tar compound, the lime is kept in suspension in the water by air pumped into it by a small steam engine, which is also used to pump water. The lime and tar compound are added to the sewage as it enters the works. It then passes to the tanks where the greater part of the suspended matter is deposited. At the last of the sub-division of the tanks, a solution of iron salt is allowed to flow into the sewage water, and advantage is taken of a slight fall to move a small water-wheel, which assists in the mixture of the iron salt with the water. The water then passes by upward filtration through two filter beds. It is not for a moment asserted that the effluent water at the Ealing works is pure, and the only question is whether it is rendered so far free from offensive matter as to allow of its discharge into the Thames. Since July, 1869, I have visited the works more than thirty times—two thirds of such visits being during the past hot and dry summer. The state of the water has necessarily varied with the more or less complete success of the treatment employed during the experiments; but since the system has been in good working order I have considered the result to be very satisfactory. The effluent water, though not absolutely bright, has only a faint milkiness, which a more liberal use of chemicals would entirely remove. It is free from smell, and samples that have been kept for weeks have only in rare instances become offensive. I have no doubt a moderate amount of attention will insure a uniformly good result."

The Effects of the Franco-Prussian War on Industry in the North German States.

On entering Germany in August last the most unobservant of travelers could hardly fail to be impressed with the fact that war, for the time being, had become the first and almost sole business of the nation, or, more properly, of the Confederate Germanic States. In Rhenish and Northeastern Prussia production seemed to have been in a great degree arrested; few civilians were to be encountered, either upon the cars or at the hotels; while the transportation of merchandise by rail or boat, except for military purposes, was also apparently entirely suspended. Private letters written as late as the middle of October describe also the same condition of affairs, and make mention of the difficulty of even finding a blacksmith to shoe a horse in many of the German villages; with the further incident that even the sextons had left their churches and gone to the actual war districts in the capacity of *Krankenstager*, or hospital attendants, whose special duty is taking care of the dead.

The opinion of German authorities, more competent to judge than a transient observer, and since communicated to the writer, has been, however, to the effect that production is not really interrupted by reason of the war in Germany, as a whole, to a greater extent than 30 per cent; the interruption being greatest in Prussia proper, where the military conscription has been the most extensive, and least in the allied States, as Saxony and Bavaria, where a smaller proportion of the young, able-bodied men are drawn into the army; and in the German States and "free cities" which, like Nassau and Frankfort, have been incorporated with Prussia since 1866, and where the Prussian military laws have only been made applicable to those who have become of age since the date of incorporation.

The general effect of the interruption of industry in Germany by reason of the war may be inferred from the earnest appeals that have recently been made to the charity of all Germans in behalf of the working population of Rhenish Prussia, Hanover, Baden, and Hesse especially. One of these appeals brought to our notice, under date of September 28th, uses the following language:

"The towns in these districts are crowded with helpless women and children, coming in to beg for bread; the fields are left untilled; the villages are swept clean of food; while the price of all the necessaries of life have gone up three-fold."

At a period as early as the last week in August the appearance in every German city, town, or hamlet of considerable numbers of men in uniform hobbling upon crutches, or with their arms or heads bandanged, testified most eloquently to the terrible results of the recent battles; while at the railway stations, or in the vicinity of the rooms or buildings appropriated for use as hospitals, the spectacle of women clad in mourning or weeping bitterly was not by any means unfrequent. There is also reason to believe, owing to the practice of grouping the local or district conscriptions into companies, battalions, or regiments, by themselves, that the almost entire destruction in some instances of such military integrals has been equivalent to the destruction of almost all the young, able-bodied men of certain small towns and villages. And as regards the comparative losses of the two armies, the opinion expressed to the writer by numbers of Prussian officers who were wounded in the battles before Metz were almost uniformly to the effect that the losses of the Prussians were greater than those of the French, inasmuch as the former were nearly always the attacking party, while their opponents, until routed, fought under cover or behind buildings, hedges, or intrenchments.—*David A. Wells in Lippincott's Magazine.*

Zinc as a Roofing Material.

Hitherto our most available metallic roofing has in this country been tinned iron plate—an article imported almost entirely from Europe. In view of our extensive deposits of zinc, the subject of zinc as a roofing material is an important one, and hence the following notes, which we take from the London *Builder*, have a peculiar value:

"The use of zinc has rapidly increased in this country within the memory of the present generation. In 1845 the annual consumption was about 5,000 tuns, which had increased in 1860 to 25,000 tuns, or five-fold. Since then the progress has been still more rapid, and the returns of one company alone recently showed the figure of £45,000 as the gross of their annual transactions in zinc, used solely for roofing in England and the colonies; and future years will probably show a still greater increase if the arrangements now made to secure 'good work' be carefully carried out.

"We should premise that throughout the continent its use has been, and still is, more extensive. In Paris it is the leading material for roofs of every description. We may mention as examples the newer portion of the Tuilleries, all the new markets, nearly all the mansions of the new Boulevards, and the Champs Elysees, dating as far back as 1830. Other places throughout Europe may be quoted to any extent, but we think the above quite sufficient to prove that the material has established itself as adapted for works of good character.

"The more extended use of zinc, for roofs in this country, to which we at first alluded, dates from the year 1859, when the Vielle Montagne Company, the largest manufactory of zinc in the world, instituted a special inquiry into the causes of the failure of zinc here, which was conducted by Mr. James Edmeston; and the result was to show clearly that the faults did not arise from the nature of the material itself, but from the use of inferior quality in some instances, and improper workmanship in others. In all cases where the zinc was good and the work properly done, it has stood the test of time, requiring neither painting nor repairs, and when of proper thickness it forms one of the most lasting materials for roofing that can be employed.

"We may here point out the causes of failure which are to be avoided.

"The first is the quality of the metal, which, when manufactured from inferior ore, contains certain other metals in admixture with the zinc, which, when exposed to atmospheric influences, set up voltaic action, leading ultimately to the destruction of the metal; this kind of zinc is spotty and uneven in color, and darker than the proper quality manufactured from the best ore, the calamine.

"The second cause of failure is defective workmanship, using the zinc too thin, not allowing sufficient play for expansion and contraction, using iron nails, or allowing the zinc to come in contact with iron or lime; in either case a destructive chemical action being the result.

"As examples of work done in this country, we may notice the cloisters of Canterbury Cathedral covered twenty-four years ago, and which have not cost £5 for repairs; the Victoria Station, ten years ago, now in a perfectly satisfactory state; as well as many stations on different railways, and many other buildings in England.

"In conclusion, we may notice the peculiar way in which the atmosphere acts upon zinc. Quoting from a report made to the Academy of Sciences by the Director of the Conservatore des Arts et Metiers:

"'It appears from actual experiment that the oxidation proceeds for about four years, gradually diminishing after the first three months, and that it then hardens into a protecting coat, *email*, of a dark-gray color, preserving the metal beneath from any further deterioration.

"'It becomes evident that as a sheet of zinc exposed to the atmosphere for a series of years loses little or nothing of its weight or thickness, and as its surface remains hard and polished like enamel, it may fairly be deduced that the following years are not likely to occasion any alteration, and therefore zinc will be in the same condition as bronze, which is protected by its *pattine* for ages.'

"There has been, to some extent, a prejudice against zinc as a lasting material, but with the evidence before us, we may safely say that where it is of a proper description and well laid, this is utterly unfounded. Its lightness and cheapness will doubtless render its use more extensive, if only necessary precautions be taken."

Poker Pictures.

The curious productions known as poker pictures, or poker drawings, have neither paint nor inlay, neither pressing nor cutting. They are nothing but panels of wood in which dark shadings have been produced by the application of red-hot tools. Many school rooms, many country mansions, and some churches, are in possession of specimens of this kind of art. A Study of a Female head, a Tiger killing a Deer, the Temptation of Christ, Cornelius sending for St. Peter, the Savior bearing the Cross, the Good Samaritan, the Head of a Rabbi, Oliver Cromwell—these are among the subjects of such pictures known to have been produced in this eccentric department of art. Connoisseurs of poker pictures talk about Smith of Skipton, Cranch of Axminster, Thompson of Wilts, and Collis of Ireland, as artists of some note. About the beginning of the present century, there was an exhibition of poker pictures in London, comprising fifty-three specimens by a Mrs. Nelson, and thirteen by Miss Nelson. The pictures were; without any high-flown words, described as having been "done on wood with hot pokers." The scorching is effected by any heated bar of iron; but in the best specimens tools of various shapes are used, to make some of the scorched lines narrower and finer than others; the artist having, literally, many irons in the fire at once. The actual lines of the device are first penciled or drawn; the scorching is to produce the shadows, the lighter tints being the result of holding the red-hot iron very close to the wood, but not quite touching. If the panel has any strongly marked lines, fibers, knots, eyes, curls, or other diversities of grain, the artist sometimes avails himself of these to produce pictorial effect, scorching around or near them, according to circumstances. In one instance a knot in the wood was made to represent the eye in a portrait, by a few judicious touches of the scorching-iron; while in another case curled lines or grain-marks were made available to represent the furrows in an old man's cheek.

How to Make Hens Lay.

People would better understand this matter, says the *Country Gentleman*, if they considered for a moment a hen to be, as she is, a small steam engine, with an egg-laying attachment, and thus there must be a constant supply of good feed and pure water to keep the engine and its attachment up to its work. In addition to keeping before hens, who have complete liberty, a constant supply of pure water, summer and winter, I have found that during the cool and cold weather of fall, winter, and spring, a dough compounded as follows, fed one day and then intermitted for two days, to produce excellent results: To three gallons of boiling water add one half an ounce of common salt, a teaspoonful of cayenne pepper, and four ounces of lard. Stir the mixture until the pepper has imparted considerable of its strength to the water Meantime the salt will have been dissolved and the lard melted. Then, while yet boiling hot, stir in a meal made of oats and corn, ground together in equal proportions, until a stiff mush is formed. Set away to cool down to a milk warmth. Before feeding taste to see that you have an overdose neither of salt nor pepper, and to prevent the hens being imposed upon with a mixture not fit to be eaten. The hen mush should not be more salt than to suit your own taste, nor so hot with pepper that you could not swallow it, were so much in your broth. Beware of too much salt, too much lard, and too much pepper; and beware, too, where the seasoning is not too high, of feeding this dough too long at a time. Let the hens be fed one day fully with it, then let it be omitted and the ordinary feed given two days, and so on, and the result will be found satisfactory. *Take notice*—hens fed this way will be a good deal less inclined to set than when fed in the ordinary manner.

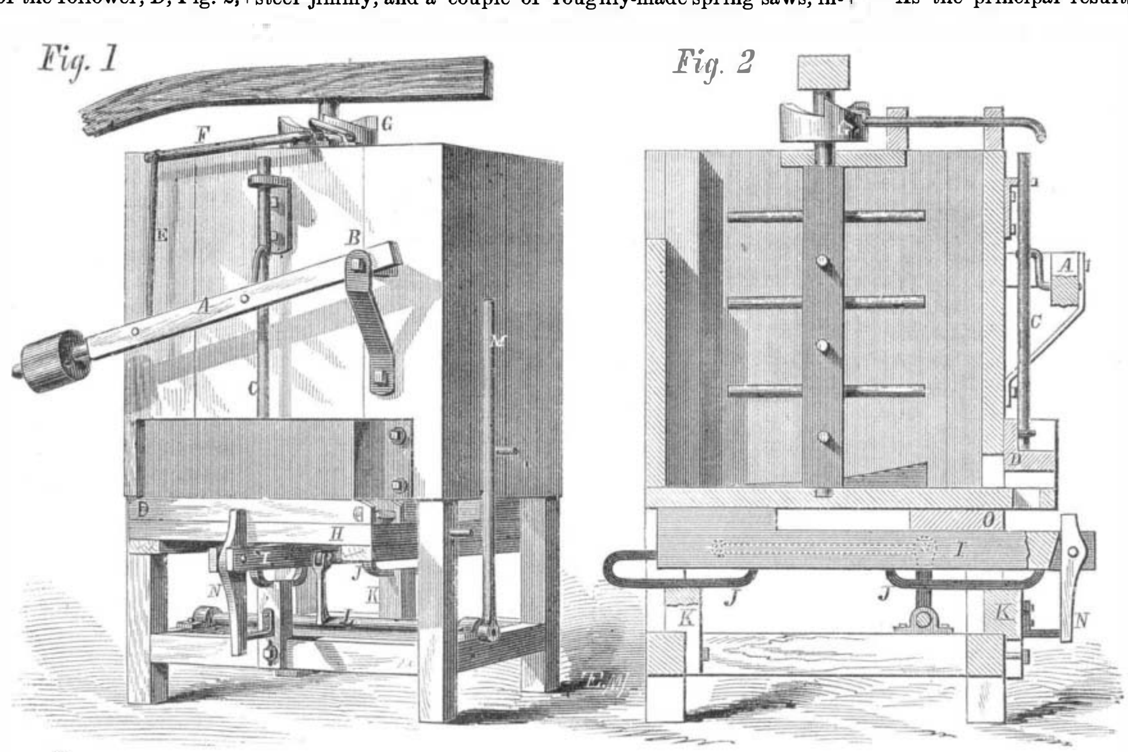
THE new method of supplying water to the Continental Hotel, in Philadelphia, by means of the artesian well, has, after a trial of seven weeks, proved satisfactory. The well is two hundred feet deep, one hundred and fifty-five of which were bored through solid rock. The bore is eight inches in diameter. Fifty thousand gallons of water can be obtained for use every day. The cost for the work was three thousand dollars. The water obtained is softer, purer, and much healthier, for both cooking and drinking purposes. The uniform temperature is fifty-five degrees.

Improvements in Brick Machines and Brick Molds.

We illustrate in connection with the present article a brick machine and a brick mold, by the employment of which, it is claimed, considerable saving may be made upon the cost of making bricks in the ordinary pugmill and molding press, as the pressing is done automatically by a device connected with the mud-mill shaft, which shaft is propelled by the usual horse-power, or by other power, as may be convenient.

Fig. 1 is a perspective view of the machine; Fig. 2 a sectional elevation, and Figs. 3, 4, and 5, details showing the construction of the mold.

A is a weighted lever, pivoted at B to the side of the mud-mill, and connected to the stock, C, of the follower, D, Fig. 2, by a crank bolt or other device which will admit of the lever and follower rising and falling together. The lever, A, is connected by a rod, E, with the arm, F, of a crank shaft, mounted on the top of the mill, and having another crank arm, which is raised by the action of the cam, G, also raising the arm, F, and the weighted lever, A, and the follower, D, at the time the arms on the lower end of the mud-mill shaft are in position to fill the mold box, and allowing the whole arrangement to fall at the proper time for pressing the bricks in the mold. This simple movement automatically effects the pressing of the bricks.



TAYLOR'S BRICK MACHINE.

The mold-box carriage, H, is mounted on a single strong beam, I, having slides, J, made of bent iron bars, attached to the under side and fitted in grooved supports, K, made vertically adjustable for regulating the carriage relatively to the bottom of the mold.

The carriage is moved back and forth by the oscillating shaft, L, and hand lever, M, in the ordinary way. N is a short lever pivoted to the front end of the carriage so that the short end will project upward in advance of the brick mold, and the longer arm hangs down so as to be arrested by a stop just before the termination of the inward movement of the carriage, whereby the short end will be forced against the mold box and clamped firmly against the plate, O, or other part of the mill to hold it while filling

Fig. 3

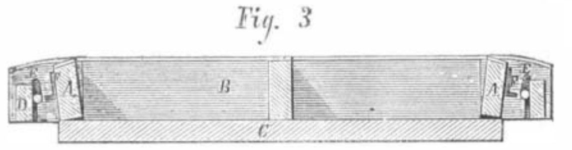


Fig. 4

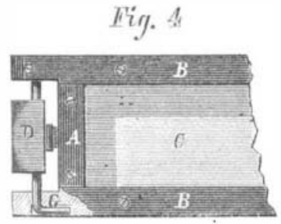
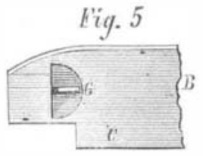


Fig. 5



The forward movement of the carriage releases the lever from the stop, so that the mold box may be drawn off the front over the short end of the lever, which will be turned down by the box.

Fig. 4 is a plan view of a portion of the mold box; Fig. 3 is a longitudinal section of the same, and Fig. 5 a partial side elevation.

The end pieces, A, of the mold are pivoted to the side pieces, B, near the bottom, C, or to the bottom itself, so as to swing outward, to release the pressed bricks when the mold is turned bottom up for discharging them, and the side pieces are also capable of swinging outward. For closing the ends and sides and holding them closed, pawls, D, are employed, pivoted near the edge and next the ends, A, of the mold, so that when the mold is right side up and held in the hands by the outside edges of the handles, the latter will turn on the pivots and cause the metal tappets, E, Fig. 3, placed on the inner edges, to bear against the plates, F, on the ends, A, and thus close the ends; and the crank arms, G, Fig. 4, will be forced down on inclines formed on the side pieces, thus forcing them together.

By this arrangement also the handles will be turned to release the ends, A, and sides, when the molds are turned bottom up and held so that at the time it is required to discharge the bricks they will be released from the friction on the ends and sides and escape more easily than if the ends and sides are immovable.

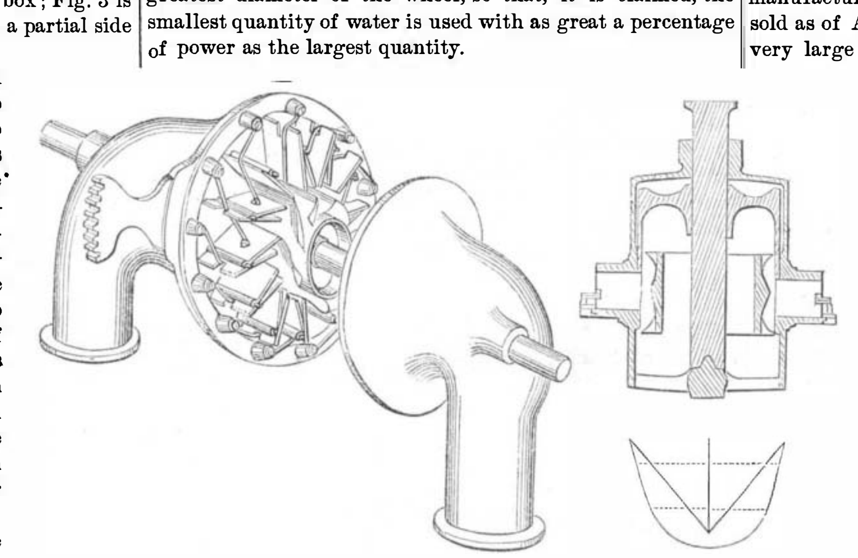
Patented, through the Scientific American Patent Agency, Nov. 29, 1870, by S. H. Taylor, assignor to himself and Le Grand Parker, either of whom address for further information, at Jacksonville, Ill.

Rope Coffee and Spring-saw Beans.

A city paper says that Minnie Lee, a nice-looking young woman, residing at No. 128 West Tenth street recently applied for admission to the Tombs prison in order to visit James Thompson, a notorious and desperate burglar, now awaiting trial at the General Sessions. She had a dinner pail in her hand, containing coffee, and a large dish containing baked beans, which she pretended to have brought for the prisoner. The woman acted in a nervous manner, and so attracted the attention of the keeper, and he proceeded to examine the pail, finding it made with a false bottom, which was filled by a coil of rope fully thirty feet long, and neatly covered by hot coffee. Minnie was at once arrested, and the cell occupied closely examined, the search being rewarded by the discovery of two old knife blades, a patent jointed steel jimmy, and a couple of roughly-made spring saws, intended to sever iron bars. When the prisoner was arraigned before Justice Dowling, at the Tombs Police Court, she was fully committed for trial, in default of $1,000 bail. After Minnie was removed to a cell the plate of beans was examined and found to contain a handsomely-made spring saw handle, a small steel wedge, and ten or twelve beautiful watch-spring saws. With all of these tools, had he obtained possession of them, Thompson would have found no difficulty in escaping from his cell, and probably from the prison, during the night.

IMPROVEMENT IN WATER WHEELS.

Our engraving shows an improved water wheel, invented by John C. Trullinger, of Oswego, Oregon, and patented by him, Feb. 11, 1868. The wheel is to be used both as a perpendicular and horizontal wheel. The wheel upon a horizontal shaft in the cases is set on the floor of the penstock, and the apertures cut in the floor for the escape of the water from the cases. The water is admitted to the buckets of the wheel through apertures of stationary guides, by gates, which are moved and adjusted by means of a series of levers, attached to the base of a movable ring. The direction given to the water by the guides causes it to impinge against the fore part of the buckets at the greatest diameter of the wheel, and, by means of the peculiar curve of the buckets in discharging, reacts upon the outer edge of the buckets and greatest diameter of the wheel, so that, it is claimed, the smallest quantity of water is used with as great a percentage of power as the largest quantity.



When the wheel is set upon a perpendicular shaft, the water is admitted by means of a gate-rig in the same manner as when the wheel is on a horizontal shaft, and impinges upon the bucket and reacts in the same manner, but discharges down through a lower case, and up over and down through the center of the wheel. The wheel is suspended by means of a hoop and hub, which is attached to the upper portion of the wheel, and rests upon a step in the lower case. The hoop and hub are inclosed by the upper case. The wheel being suspended by means of the hoop and hub, has no arms, and the water which discharges over the top and through the center of the wheel meets with no obstructions.

The German North Polar Expedition.

In a letter from Gotha, dated the 1st of October, Dr. Petermann thus sums up the results of the expedition:

"The results and successes of the second German North Polar expedition are manifold in character, and relate to various branches of science; they prove the approachability of East Greenland in high latitudes; a comparative fullness of animal and vegetable life in the interior of the land, the existence of beds of brown coal, navigable fjordes, going deep into the country, immense mountains, as high as fourteen thousand feet, and for these latitudes a not unfavorable temperature.

"As the principal results may be assumed, that with this expedition a new path to the final exploration of the North Polar regions is opened, new ground trodden, a new direction taken, and a new basis won. From the lands lying nearest to East Greenland, for example, the west coast of Spitzbergen and Greenland, scientific circles had long possessed large natural scientific collections of every description, which have given of late years important insight, especially in regard to the geology and history of our earth; it is easy at any time to bring whole ship-loads of collections relating to these departments to Europe; but it was not so with East Greenland, this extended *vis-à-vis* of our quarter of the globe. Of this hitherto almost unknown, scientifically, great district, every exploration, every collection—every single petrification for example—is of especial value toward filling up the knowledge of our earth; Ober-Lieutenant Payer gathered on his various land excursions in East Greenland not less than twenty boxes of geological specimens, among them being many petrifications. With his theodolite he ascended up as high as seven thousand feet, accompanied by Dr. Copeland and Peter Ellinger. No other land possesses such magnificent characteristics, navigable fjordes, with a high temperature of water and air, immense mountains rising to a hight of fourteen thousand feet, great herds of musk-oxen and reindeer, etc., as Greenland.

"That a German expedition of discovery, fitted out from voluntary contributions from prince and people, has here opened up the way to the Pole, will bring imperishable fame to Germany. For more than five years great exertions have been made in England, France, and America to set afoot a scientific expedition for the exploration of the Central Arctic regions. Germany, however, has gone first into actual duty, and has achieved already great results."

Sewing Machines.

The number of these machines made by twelve principal companies during the past year amounted to 320,669, which, at the average price of a first class machine, say $75, aggregated total, $24,050,170. The first class American sewing machine is to be found in all quarters of the world, and the supply comes principally from this city and Boston. There are many cheap machines which are sold all the way from two to twenty dollars, which are not counted in these figures; also many cheap imitations of the best American machines manufactured in England and on the Continent which are sold as of American make. Germany, in particular, does a very large business of this kind, Hamburg having no less than six large factories running, and finding a market principally in Russia, with which country we have comparatively little direct trade. Notwithstanding this competition, the machines sent from this country command high prices abroad, on account of excellence in workmanship and finish, and are exported in large numbers annually. All of the largest manufacturers have agencies in the principal cities of Europe, and receive large orders from abroad by nearly every steamer. The largest number made by any one concern in a year was 86,781. Notwithstanding the large amount of work which can be done by these ingenious contrivances, which used to be done entirely by hand, there seems to be no diminution of hand work in many branches of business. As the cost of manufacturing good machines varies from $12·50 to $60, and the prices at which they are sold range from $60 to $350, the profits of the business are enormous.

THE AMERICAN DESERT.—R. S. Elliott, Industrial Agent of the Kansas and Pacific Railroad, reports upon extensive experiments to cultivate the soil of the great plain, or American desert, along that road. Irrigation was dispensed with, and success is claimed, the result being thus summarized: Forests can be established in all parts of the plains, even without artificial irrigation. Much deeper plowing will be required than for winter grains or forage plants. The most rapid growers are the best trees for first planting. Planting seeds is better than to transplant young trees.