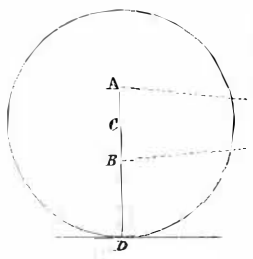
ciency is in the same ratio." This is not true, as levers of the third and second classes may be as efficient as some levers of the first. You also say that the axle is the fulcrum and the part of the wheel on the rail is the point where the weight is applied. If such were the case the power required would be the same in both cases, as can be easily proved.



Let C be the center of the wheel resting on the rail at D, and A B the positions of the crank at upper and lower half-center respectively. Now, let P be the power required to move the train with the crank at A, and P′ the power at B; W the weight to be moved, which, according to your supposition, acts at D, while the fulcrum is at G. Also, let AC or CB=b, and CD=a, now in any lever,

$$\text{power} = \frac{\text{weight} \bowtie \text{distance of weight from fulcrum.}}{\text{distance of power from fulcrum.}}$$

Applying this we have

$$P = \frac{W \times a}{b}$$

$$P' = \frac{W \times a}{b}$$

which means that the power is the same in both cases, which is not true. The error lies in assuming the point, C, as the fulcrum, instead of D. The point C is really the place where the weight to be moved is applied; D is the fixed point or fulcrum. With these suppositions, then, apply the formula for the power before given, and we have

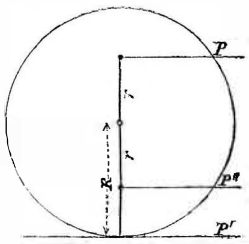
$$P = \frac{W \times a}{a+b,} \qquad P = \frac{W \times a}{a-b}$$

These fractions have the same numerator, but the denominator of the second is the smallest, hence the fraction is the largest, or P′ is greater than P; in other words, it will take more power to start a train on the lower than on the upper half-center. This is the true explanation. SETH C. CHANDLER, JR.

Boston, Sept. 9th, 1864.

MESSRS. EDITORS:—Your edition of the 10th inst. contains a query, viz.:—"Will it take any more power to start a train when the crank is on the upper half-center than when it is on the lower half-center?"

The reason given for the first statement in the solution proves nothing, unless it be its incorrectness. It says that levers are of three classes; that when the crank is on the upper half-center it forms a lever of the first class; and when on the lower half-center one of the third—the center of the wheel being the fulcrum. All very true The next statement, that, "therefore it would take more power to move the train when on the lower center than when on the upper" is not logical, and must be incorrect. For the class of lever has nothing to do with the power when the lengths of the lever are the same, except in giving direction. A given weight will lift the same amount when applied to the lever of the first class, as when applied to the third.



Suppose, for convenience, we put the two positions of the crank in the same straight line, and apply the powers perpendicularly, as shown on the diagram. The center of the wheel is the fulcrum, the crank is one lever, r; the radius of the wheel, R, is the other; neither will change in length. The power, P, through the lever, r, is just sufficient to overcome the power, P′, working through the lever, R. The power, P″, working through, r, is also just sufficient to overcome the power, P′, through R. Condensing these statements we have Pr=P′R when on the upper center, and P″r=P′R when on the lower center, and "Things which are equal to the same thing are equal to each other," hence Pr=P″r or P=P″; no more power is required to move the train from the lower than from the upper center.

H. J. JOHNSON.

Providence, R. I., Sept. 17th, 1864.

It is related of Prof. Whewell, so famous for his vast learning, that he made a certain statement in one of his lectures, and after the lecture one of the class reminded him that he stated exactly the reverse the week before. He replied, "Don't you think I know more than I did last week?"

On page 164 we gave to a correspondent an answer, which, on more careful examination, we see was incorrect. It is manifest that the power required to start a train would be precisely the same, whether the crank was turned vertically upward or vertically downward.

A Change in Currency and Wages.

For along time the wages of mechanics were maintained in California by the influence of the Placer mines. When a man could make his $6 per day with a sluice anywhere between Mariposa and Downieville, carpenters could not be hired in San Francisco for $5. But the Placer mines are almost exhausted. The solitary miner without capital has now no career open before him. The placers of the Sierra Nevada and of Frazer River; the argentiferous deposits of Washoe and Reese River, and prospecting for gold, silver, copper and coal have been successively "played out" as "spheres" for poor men generally, and now their chief reliance is in work for wages at a fixed price. Our labor market has a downward tendency. As the wages of the mechanic fell from $16 per day in '49 to $8 in '51, and to $6 in '43, and to $4 in '56, so they will go on falling hereafter. There may be no decrease this year or next, but no combinations can defy the laws of trade. It is plain that the laboring class would lose by the overthrow of our gold currency.—*Alta California.*

MISCELLANEOUS SUMMARY.

POVERTY A RELATIVE TERM.—Bulwer says that poverty is only an idea, in nine cases out of ten. Some men with ten thousand dollars a year suffer more for want of means than others with three hundred. The reason is, the richer man has artificial wants. His income is ten thousand, and he suffers enough from being dunned for unpaid debts to kill a sensitive man. A man who earns a dollar a day, and does not run in debt, is the happiest of the two. Very few people who have never been rich willbelieve this, but it is as true as God's word. There are thousands and thousands with princely incomes who never know a moment's peace because they live above their means. There is really more happiness in the world among working people than among those who are called rich.

INVENTION OF THE HAND GEAR.—It has been said that we are indebted for the important invention in the steam-engine, termed hand gear, by which its valves or cocks are worked by the machine itself, to an idle boy named Humphrey Potter, who, being employed to stop and open a valve, saw that he could save himself the trouble of attending and watching it, by fixing a plug upon a part of the machine which came to the place at the proper times, in consequence of the general movement. If this anecdote be true, what does it prove? That Humphrey Potter might be very idle, but that he was, at the same time, very ingenious. It was a contrivance, not the result of accident, but of acute observation and successful experiment.

HOME OF THE MUSCOVY DUCK.—At a meeting of the Academy of Natural Sciences, Philadelphia, Mr. Hill stated that the habitat of the Muscovy duck is the Lake of Nicaragua. There travelers see them at all times, either in small breeding coteries, or large flocks. In the wild state their plumage is dark without any admixture of white. They were originally procured from the Mosquito shore, the country of the Muysca Indians (see Humboldt's researches), and hence is derived the name of Musco duck, corrupted into Muscovy duck. The West Indian Islanders had early naturalized them, for on the discovery of Columbus, they speak of "ducks as large as geese," that they found among the Indians.

ENORMOUS BELTS.—The Boston *Commercial Bulletin* says:—"Messrs. Edward Page & Co. had on exhibition in State street, this week, five immense belts, made of heavy slaughter whole hides. The two longer were 246½ feet long, and 28 inches wide, double thickness throughout, and consuming 200 whole hides, and weighing nearly 1,000 lbs. each. These belts were made for the grain elevator of the Michigan Central Railroad Company. They were manufactured at Lawrence, Mass.

C. S. HUBBARD, of New Haven, Conn., Agent for Parson Brownlow's *Knoxville Whig*, has been notified that the non-reception of recent numbers of the paper has been owing to Wheeler's cutting railroad communication in Tennessee, thereby interrupting the transmission of the paper to Eastern subscribers. The missing numbers will be replaced by other numbers in the future.

DR. RICHARDSON, an English chemist, says that iodine, placed in a small box, with a perforated lid, destroys organic poison in rooms. During the continuance of an epidemic small-pox in London he saw the method used with benefit.

HAIR BRUSHES may be well and quickly cleaned, without wetting, by striking them, bristles down, flatly on a table. The dust shakes out and the down may be combed off.

THE *Magic*, of Bristol, R. I., a boat which beat everything easily at the Bridgeport regatta, was built and is owned and sailed by a blind man.

ENGLAND'S iron-clad fleet already afloat includes nineteen vessels, the largest of which carries forty guns and the smallest four guns, the aggregate being 409 guns, with a tunnage of 71,958 and horse-power 14,762. She has thirty-nine other iron-cased ships afloat, having from one to sixteen guns, and twelve powerful ships under construction, which will carry in all 255 guns, are of 43,160 tuns burthen, and 9,527 horse-power. Some of those vessels have cost as high as £381,000, or nearly two millions of dollars. England has expended $23,000,000 during the past year in building her iron-clad navy, a sum almost as large as it has cost our Government to build all the monitors, we being at war and England at peace. There will be thirty of these English iron-clads capable of firing a broadside. We have but one broadside iron-clad, the *Ironsides*.

A COSTLY DAM.—The *Railway Times* says:—"The cost of the mammoth dam nearly completed across the Deerfield river at the Hoosac tunnel, will be at least half a million dollars. The water power furnished by it is to be used to drive machinery for operating drills in the tunnel and furnishing it with air. The State has purchased ten and a half acres of land around the central shaft, which is the largest and deepest shaft ever sunk, the only one approaching it being one of 820 feet in depth to reach the tunnel grade. Only 60 feet of this distance is now accomplished, the size being 85 by 97 feet.

USELESSNESS OF EARTHING UP POTATOES.—By drawing up the earth over the potato, in sloping ridges, it is deprived of its due supply of moisture by rains, for when they fall the water is cast into the ditches Further, in regard to the idea, that by thus earthing up the number of tubers is increased, the effect is quite the reverse; for experience proves that a potato placed an inch only under the surface of the earth, will produce more tubers than one planted at the depth of a foot.

THE "west shaft" at the Hoosic tunnel is now sunk about 420 feet, and the temperature at the bottom during the warmest day is 35 degrees. The depth of water in the mountain is about nine feet, and the engine employed at the shaft removes 25 gallons each revolution. The engine also works a fan by which the men are supplied with air. The number of men employed on the west side of the mountain is 350.

A Submarine Vessel.

A correspondent who has been down in the submarine vessel recently invented and manufactured in this city by S. S. Merriam, and just tested by himself and the Government near New York, sends us the following account of his experiences:—"Entering the singular vessel from the top, the door was closed, and the order, 'Men, to your places' given to the little crew, who promptly obeyed. When everything was ready, Mr. Merriam turned some valves and the compressed air came hissing in, producing an unpleasant sensation upon the drum of the ear, of which one was at once relieved by inspiring and swallowing. The vessel seemed perfectly under control, for we stopped when half down to the bottom, and raised the door on the bottom of the boat, but the air inside of course prevented any water from coming in, even enough to wet the soles of our feet. One of the crew from your city improved the opportunity to dive out and come up on the surface of the water, much to the astonishment of the spectators on the bank. He afterwards returned and entered the vessel from the bottom, when the door was closed, another and heavier rush of compressed air came in, and we were on the bed of the river, 20 odd feet under water, this distance requiring an additional pressure to resist the water with the door open. We could stand on the bottom of the river and not wet our feet, and at that distance under water could easily see to read by the light that came in at the glass windows. Bells ringing outside were also heard distinctly. To return to the rest of the world only a few strokes of the pumps were necessary; the air rushed out of the bottom and the boat was quickly on the surface of the water. We moved with a propeller easily under as well as upon the water, and in all respects the vessel worked so completely that its success is undoubted."—*Springfield Republican.*

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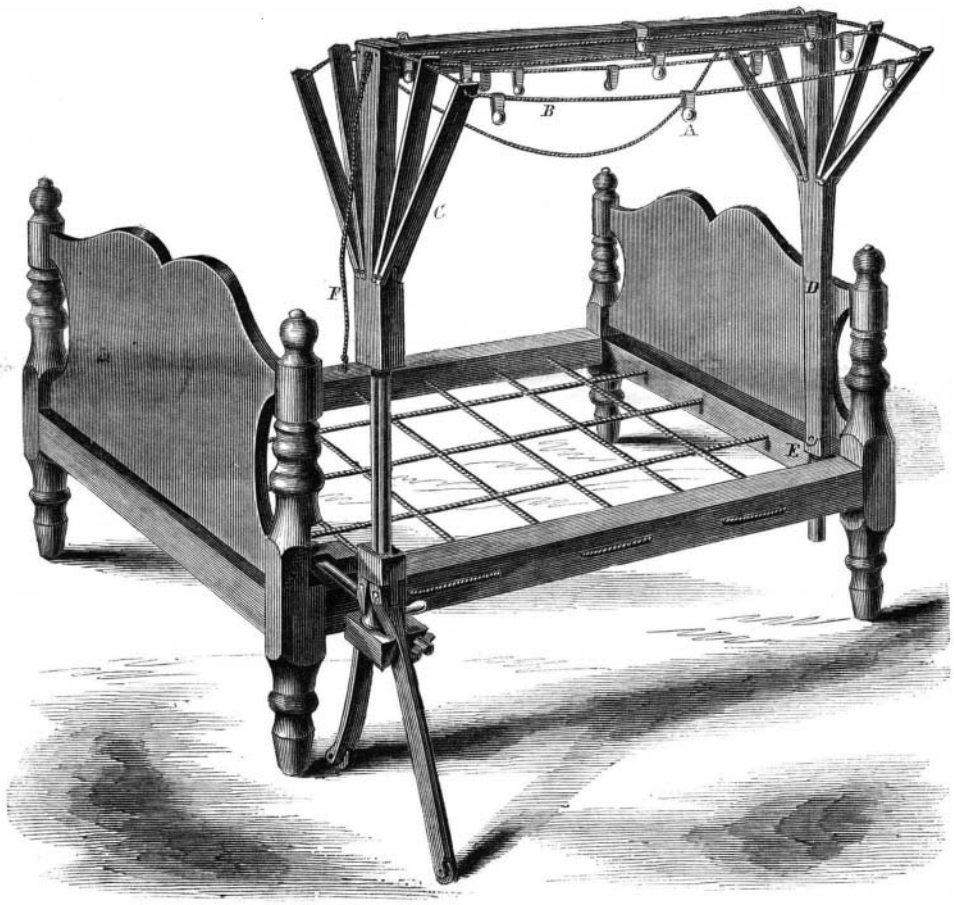
Attachment for Ventilating Bed-clothes.

It is well known among civilized people that there is no part of housekeeping that requires more attention than bedding. For comfort this is desirable, but for sanitary reasons it is very important that the clothes should be thoroughly aired and ventilated for an hour or more daily. This is very often done by placing the bed linen on chairs or over the foot-board; in so doing, however, it gets dragged on the floor and more or less soiled, besides entailing considerable labor. With this attachment the clothes are buttoned to the tapes, A, on the cords, B, which, in turn, are rove through the arms, C. The arms are attached to uprights, D, and are jointed at E, so that the apparatus can be turned down horizontally when not in use. When in use it is erected as shown, and the clothes are all drawn up or extended by pulling the cord, F. This insures thorough exposure with but little labor. The legs at one end permit the attachment to be rolled one side against the wall when necessary for making or taking down the bedstead.

The inventor says that one of these fixtures has been in use for some time, and has been highly praised by housekeepers for its utility. It is not liable to get out of order and is easily and cheaply constructed.

The invention was patented through the Scientific American Patent Agency on the 16th of August, 1864, by J. H. Martin, of Hartford, Washington county, N. Y., who can be addressed for further information. [See advertisement on another page.]



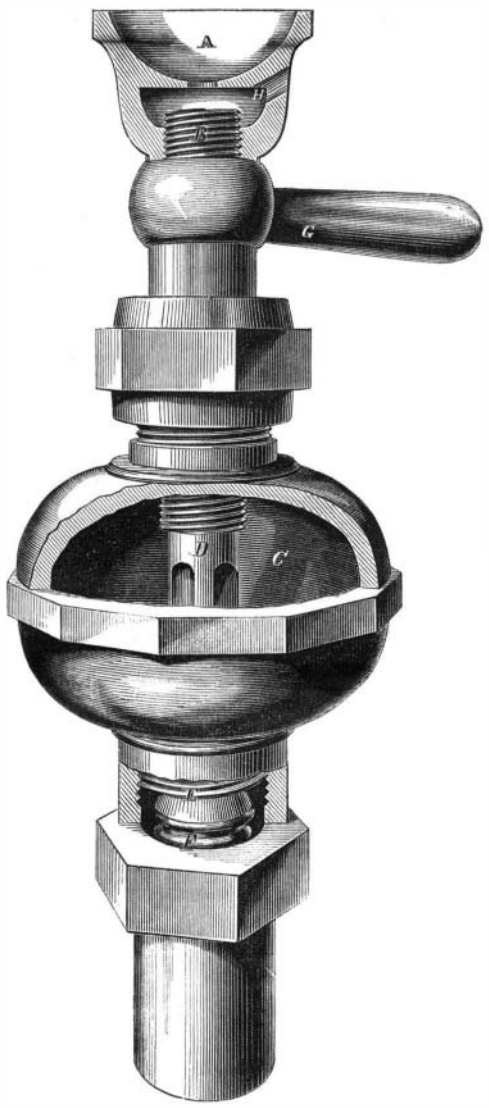
MARTIN'S ATTACHMENT FOR VENTILATING BED-CLOTHES.

A SEED-BAG.

Mr. Overton, in explaining at the Polytechnic Association the mode of raising petroleum in the oil region of Pennsylvania, stated that after the holes are bored through the earth and rock down to the cavities containing the oil, a pipe is inserted through which the oil is pumped up. As, in sinking the holes from 100 to 600 feet, several springs and streams of water are usually encountered, this water, if allowed to fall down to the bottom of the hole, would require to be raised by the pump, and would thus add materially to the expense of procuring the oil. To prevent the water from falling to the bottom of the hole the annular space around the pipe is closed water-tight near the lower end of the pipe. This is effected by surrounding the pipe with a bag some two feet in length filled with dry flax-seed. After the bag is in place the seed absorb water, and swell so as to close the space perfectly water tight.

ROSS'S LUBRICATOR.

The old-fashioned globe lubricator with its three cocks is a great nuisance. In order to lubricate a cylinder, the lower cock must be first shut, the pet cock opened to blow the steam out of the globe, the pet cock shut again, and the oil poured in, after which the upper cock must be shut and the lower one opened before the oil will flow down to its place. This is a tedious operation, and the lubricator herewith illustrated is a much better one for the purpose, In this cup but one handle has to be turned to lubricate the cylinder. The operation is as follows. Oil is poured into the cup, A, from whence it runs down through the pipe, B, into the reservoir, C. In this there is a three-sided plug, D, which has a valve seat on the pipe, B, and another seat, E, below on the bottom of the reservoir; this one is a little larger than the upper, and the plug is put in from below. There is also a spiral spring, F, bearing on the end of the plug. The oil is introduced to the reservoir by turning the handle, G, around a few times; this act unscrews the pipe, B, from the plug, D, and the oil consequently runs down into C; the spiral spring below forces the plug against its lower seat and prevents steam from blowing out during the operation. The oil runs into the cylinder from the reservoir when the handle, G, is run down as far as it can go. This forces the lower end of the plug off its seat and opens the passage to the cylinder. Steam rushes up into the reservoir and makes the pressure equable, so that there is no more in the chest than in the cup. The holes, H, allow the air to escape when oil is poured in. This cup was patented March 1st, 1864, by Robert Ross, of Bethlehem, Pa., and assigned to B. E. Lehman, of the same place. For further particulars address Mr. Lehman as above; or Felix Campbell, 79 John street, New York City.



Street Sweepings.

Dr. Littlejohn says, in a paper on the cleansing operations in Edinburgh, that by an efficient staff of scavengers, fifty thousand tuns of solid refuse are annually removed from the streets and placed in depots in the neighborhood of the town. The sale of this refuse brings into the municipal treasury £7,000 per annum. The entire cost of cleansing the city is £13,000 per annum, viz., £6,000 for wages, £6,000 for cost of conveyance of refuse to the depots, and £1,000 for wear and tear of materials. The Old Town and the poorer districts of the New Town, are visited by the wagons morning and evening; the greater proportion of the New Town only receives a morning visit. Thus all accumulations of refuse for a period longer than a few hours are prevented; the streets are thoroughly cleansed daily; a large number of men are kept in regular employment, many of whom might otherwise burden the rates; the rural districts obtain an excellent manure at a moderate cost, and the police rates are diminished by 3d. in the £1.

A Smoking Automaton.

Many men smoke mechanically, but we never heard of one before smoking by machinery other than that furnished by nature. The *Salem Gazette* says:—

"Mr. Thomas B. Russell, an ingenious machinist of this city, has exhibited to some of his friends a curious piece of mechanism which is now at his residence, No. 354 Essex street. It consists of the figure of a man, seated in a common chair, and holding a cigar in his mouth. By winding up a weight and thus setting in motion an ingenious piece of machinery, the cigar, when lighted, and also the mouth of the figure, are made, at regular intervals, to emit a steady stream of smoke, interspersed with puffs, that a professional smoker could not excel. By this process a cigar will be smoked up as quickly and naturally as a living man could do it. The machinery by which the result is accomplished, consists of a series of wheels not unlike those by which a clock is made to strike. Rubber tubes or pipes are conveyed from the mouth of the figure to bellows, which are slowly worked. Two valves, nicely adjusted, regulate the drawing in and emission of the smoke.

On the Respiration of Flowers.—M. Cahours, in a note to the French Academy of Sciences, says, that while the green parts of plants, under the influence of light, absorb carbonic acid, assimilate the carbon, and give out oxygen, the colored parts, on the contrary, under the same circumstances, absorb oxygen, and give out carbonic acid. The amount of corbonic acid evolved seemed to increase as the temperature rose; and a growing flower gave out more than a fully blown one.

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