BOILER CLEANER.

The object of this invention, patented by Mr. George A. Galloway, of Le Claire, Iowa, is to provide means for cleaning the fire surfaces of soot and other accumulations. The cleaner is constructed of two curved pipes connected to a T and bent to the shape of the boiler, their length being according to the extent of fire surface. The ends of the tubes are closed by plugs, and the upper side of the tube is formed with holes made so as to discharge steam at about an angle of 30 degrees. To the T is attached a tube of suitable length for use in handling the cleaner, and also for supplying steam, for which purpose the outer end of

GALLOWAY'S BOILER CLEANER.

the handle is connected by a flexible pipe with the boiler. In using the cleaner, it is inserted in the fire box and moved closely over the fire surface of the boiler, when the jets of steam act to remove the soot and scale. This action renders the surface cleaner, and results in a great saving in fuel by the removal of those non-conducting materials which always accumulate on the fire surface of a boiler.

A NEW AERIAL MACHINE.

We illustrate a new plan for aerial navigation designed by Dr. W. O. Ayres, of New Haven, Conn. In this apparatus the motive power is to be compressed air, which is intended to be condensed within the two drums, seen in the engraving; the air also fills the tubular framing of the machine. The air will be condensed under a pressure of say three thousand pounds to the square inch. The drums and tubes are expected to hold air enough to drive the engines and attached propellers for several hours. The author gives the following additional particulars:

"The plan and form which we suggest is not designed or expected to be by any means exclusive. The illustration shows it very clearly, and we believe that a machine constructed as here represented can do its work successfully. The propellers may be made to present a much greater extent of surface than the artist has drawn; the only thing for which we contend is that the principle shall be maintained.

"In order to afford support for our two systems of propellers, we must necessarily have vertical posts and horizontal bearings as well, that is, a table-like frame One of four feet by three, supported by four legs four feet in height, will give us the required space, and if made of steel quarter-inch tubing, will have all the strength needed. The rider sits in a seat like that of a bicycle, suspended by steel wires from the top frame, with which his shoulders are about level.

"The four horizontal propellers have their bearings on the vertical posts just below the top frame, thus bringing the lifting power as far above the center of gravity as possible. The vertically moving propeller revolves on a shaft behind the shoulders of the rider, midway between the side bars of the top frame. The air cylinders are two, for better division of weight, but are so connected that practically their air mass is one. A driving engine is attached to each cylinder, but the two work synchronously, and the regulating valve is controlled by the rider's left hand. They are so geared as to propel the upper horizontal fans, which have been already mentioned.

"The rider's feet rest on pedals like those of a bicycle, and by suitable connection actuate two horizontal fans as shown, so that the entire strength of his lower extremities can be brought to the assistance of the compressed air in the work of 'lifting.'

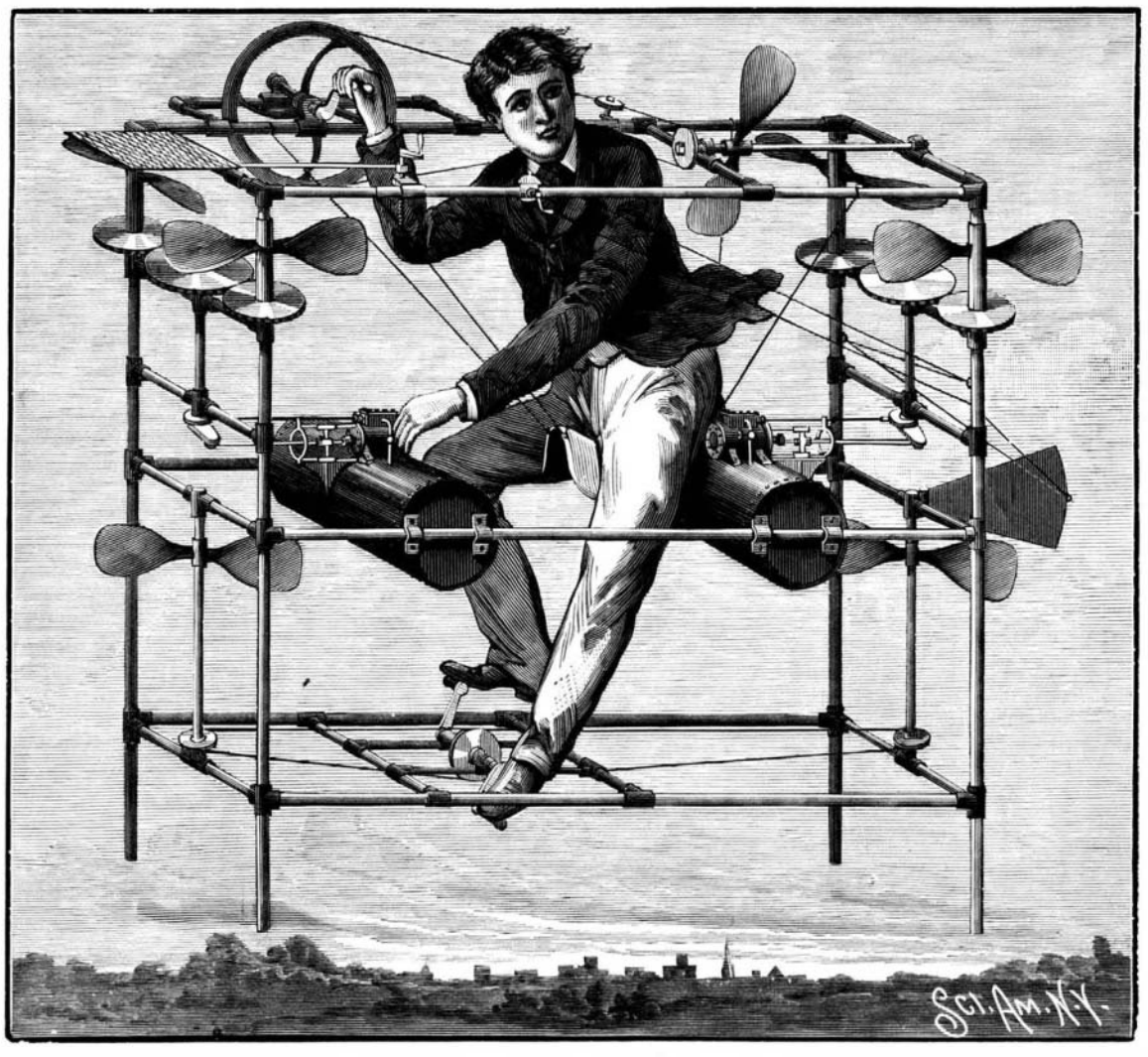
"The vertically revolving propeller is driven by the right arm of the rider, and the gearing, as shown, is very simple. An ordinary crank handle is conveniently placed for his grasp, and he drives the fan by direct motion.

"The rate at which these sets of propellers must be driven, so as to do effective work, can be determined only by actual experiment. We have no data from which to calculate with precision. The formulas that apply to boat propellers can give us but little aid, since the circumstances are so diverse. It is, however, probably safe to assume that the motion can be advantageously made much more rapid in air than in water.

"Thus far we have only two motions, vertical and horizontally direct; but our apparatus must be steered precisely like a boat, and it must ascend and descend obliquely. The former scarcely needs mention; the rudder, as shown, is controlled by cords whose 'wheel' is on the upper bar near the rider's left shoulder. But for ascent we need a new arrangement, though a very simple one. A flap or plate, twelve inches square, is hinged on the anterior cross bar, capable of motion in a vertical direction only. It must possess no little firmness and strength, and will need to be made of tubing like that of the main frame, covered with linen or silk. It is so controlled by strong cords or chains that it can be set at any required angle, and held there rigidly. Its 'wheel' is just in advance of that of the 'rudder,' as shown.

"This plate has no influence on the elevating power of the horizontal fans; but supposing them to be in motion, at just such a rate as to counterbalance the power of gravitation, then, with the vertical fan in action, the angle at which this horizontal rudder is set will determine the gradual elevation or descent of the machine.

"The apparatus, thus constructed, can all be brought within the weight of 65 pounds, and we have therefore to provide for lifting 225 pounds, assuming operator to weigh 160 pounds. This can certainly be done with the expenditure which we have specified, one-sixth of a nominal horse power, aided by the efforts of the rider."

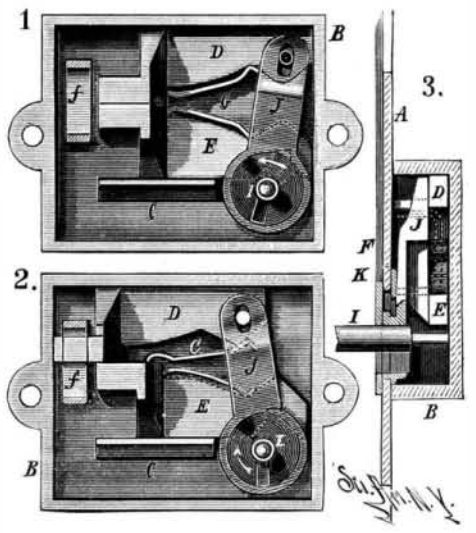


AYRES' NEW AERIAL MACHINE.

A HARPOON of the pattern made over forty years ago was taken from a whale caught near Coos Bay, Oregon, recently.

TRUNK LOCK.

The lock shown in the accompanying cut is especially designed for trunks, and is one that requires a special transverse manipulation of the key to unlock it. Between one of the side walls of the case and a lug, C, on the inside of its back plate are two bolts, D E, sliding independently of each other; the ends of the bolts enter the eye, *f*, of the hasp, which is hinged to the trunk lid in any approved way. The spring, G, having opposite arms, acts against the opposing edges of both bolts, so as to hold either in the projected or withdrawn po-



DUPONT'S TRUNK LOCK.

sitions. The lower bolt has a notch, shown by the dotted lines in Figs. 1 and 2, to receive the bit of the key, by which it may be thrown either way when the key is pushed in as far as it will go. The arm, J, is held to the inside of the faceplate by a split collar, K, upon which the arm is free to turn. The arm is connected to the inner end of the upper bolt by a pin entering a slot, so that the arm will throw the bolt either way when the bit of the key is held forward from the back plate so as to come within the hub of the arm. The keyhole in the hub coincides with the keyhole in the escutcheon when the arm is thrown out.

If an attempt were made to open the lock by any one unacquainted with its construction, the key, being naturally pushed in as far as it would go, would throw the lower bolt back, but the hasp would still be held by the upper bolt, to throw which it is necessary to draw the bit of the key outward clear of the lower bolt and into the hub of the arm, J. When this arm has been thrown back, its keyhole is out of line with the keyhole of the escutcheon; hence after unlocking the trunk the key can only be withdrawn by throwing the bolt outward.

This invention has been patented by Mr. L. E. Dupont, P. O. box 104, Farnham, Quebec, Canada.

Powerful Refrigerants.

Some experiments recently made by M. Olszewski appear to show that liquid oxygen is one of the best of refrigerants. He found that when liquefied oxygen was allowed to vaporize under the pressure of one atmosphere, a temperature as low as —181·4° C. was produced. The temperature fell still further when the pressure on the liquid oxygen was reduced to nine millimeters of mercury. Though the pressure was reduced still further to four millimeters of mercury, yet the oxygen remained liquid. Liquefied nitrogen, when allowed to evaporate under a pressure of sixty millimeters of mercury, gave a temperature of —214° C., only the surface of the liquid gas became opaque from incipient solidification. Under lower pressures the nitrogen solidified, and temperatures as low as —225° C. were recorded by the hydrogen thermometer. The lowest temperature obtained by allowing liquefied carbonic oxide to vaporize was —220·5° C.

Wall Paper.

The following table from the *N. Y. Newsdealer* shows how many rolls of wall paper are required to cover a room of the dimensions indicated by the figures in the left hand column, also the number of yards of border necessary:

Size of Room.	Height of Ceiling.	Number of Doors.	Number of Windows.	Rolls of Paper.	Yards of Border.
7 x 9	8	1	1	6	11
"	9	1	1	7	11
"	10	1	1	8	11
"	12	1	1	10	11
8 x 10	8	1	1	7	12
"	9	1	1	8	12
"	10	1	1	9	12
"	12	1	1	11	12
9 x 11	8	1	1	8	14
"	9	1	1	10	14
"	10	1	1	11	14
"	12	1	1	13	14
10 x 12	8	1	1	9	15
"	9	1	1	10	15
"	10	1	1	11	15
"	12	1	1	13	15
11 x 12	8	2	2	8	16
"	9	2	2	9	16
"	10	2	2	10	16
"	12	2	2	13	16
12 x 13	8	2	2	8	17
"	9	2	2	10	17
"	10	2	2	11	17
"	12	2	2	14	17
12 x 15 or 13 x 14	8	2	2	10	18
" "	9	2	2	11	18
" "	10	2	2	12	18
" "	12	2	2	15	18
13 x 15	8	2	2	10	19
	9	2	2	11	19
"	10	2	2	13	19
"	12	2	2	16	19
14 x 16	9	2	2	12	20
	10	2	2	14	20
"	12	2	2	17	20
14 x 18	9	2	2	13	22
"	10	2	2	15	22
"	12	2	2	19	22
15 x 16	10	2	2	15	21
15 x 17	12	2	2	19	22

Deduct one-half roll of paperfor each ordinary door or window extra—size 4 x 7 feet.

A New Sewage Process.

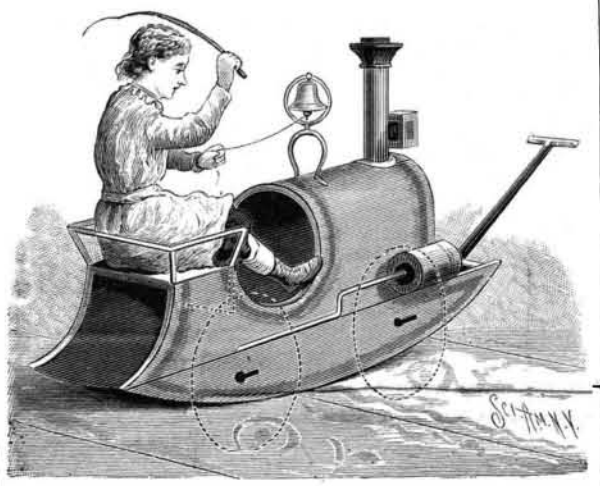
At the suggestion of Dr. Tresh, a novel process has been devised for treating the sewage of Buxton. The precipitant brought into play is simply a mineral water derived from the lower coal formations about two miles above Buxton. It contains 1·2 grs. of iron per gallon in the state of ferrous carbonate, held in solution by carbonic acid. On exposure to the air the carbonic acid escapes, and the iron, taking up more oxygen, subsides in the state of ferric hydroxide in combination with a considerable part of the organic impurities, suspended and dissolved. The results, according to an analysis quoted in the *Leek Times*, are very satisfactory. The sewage before treatment contains free ammonia 11·74 per million, and albuminoid ammonia 1·60. After treatment these figures are reduced to free ammonia 4·00 parts per million, and albuminoid ammonia 0·30 do. The sewage is decidedly weak, but the purification effected is very satisfactory, coming far within the limit proposed by the late Rivers Pollution Commissioners, and supplying additional proof that mineral salts are fully capable or precipitating dissolved organic impurities. Such waters are not uncommon, and may find similar applications elsewhere. The only unsatisfactory point which we note is that the effluent is stated as being "distinctly alkaline."

The Walnut.

A writer in *The Garden* (London) wonders why this tree is comparatively but little planted, a singular fact when the beauty and value of its wood are taken into account. For gunstocks and much of our finer sorts of furniture, walnut timber is invaluable. Walnut trees, moreover, are free growing on almost all kinds of soil, and the crops of nuts which they produce would pay at least the rent of the land on which they grow, while freeholds might be purchased with trees of fourscore years of age. Walnuts in a landscape, also, are trees of mark, their magnificent heads of fine foliage in parks or paddocks rendering them especially adapted for such situations. They associate well with oak, beech, elm, sweet and horse chestnut, as well as with various other trees, and they do not rob the land more than their companions do. Their smooth, glossy leaves are washed clean by every shower, and the foliage is not so thick as to throw the rain off the grass or to keep air currents from circulating freely among the branches. There are, therefore, no trees either in park or pasture under which herbage grows better than it does under walnuts. Besides, walnuts come into leaf late, make their growth quickly, and lose their foliage nearly all at once after the first autumn frost. Thus a chance is given to take the leaves out of the way, so as not to injure the grass, while the shining dark young wood, with the grayish mature limbs, are left full in view. As to any tree that will grow more quickly into a size to be useful, I do not know where to look for it. I have seen old walnut trees that measured from 60 feet to 90 feet high; diameter of branches from 60 feet to 96 feet; and of bole or trunk from 3 feet to 5 feet diameter; and no doubt larger trees are elsewhere to be found.

A NOVEL TOY.

The body of the toy has rockers or runners secured to it, and is composed of a bottom and curved cover in imitation of a locomotive, the cover being closed at its forward end and open at its rear end, and extended to form side pieces and seat supports, which are braced by a cross piece at the front edge of the seat board. A rail is placed around the seat board. To the cover are secured a smokestack, cylinders, and piston rods in imitation of these parts on a locomotive, and to the tongue of the bell is attached a string by which the bell may be struck by a child sitting upon the seat. Between the forward ends of the rockers is a round to which the tongue is secured, by which the toy may be drawn along the floor. Through the runners are formed



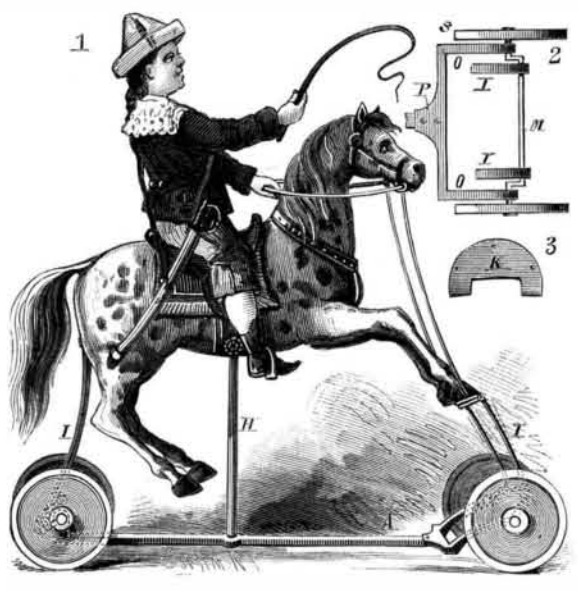
NICHOLS' NOVEL TOY.

openings to receive axles carrying wheels upon their ends, upon which the toy may be run instead of upon the rockers. The toy is adapted for use as a sled or wagon, or as a rocking toy, and being made in imitation of a locomotive is very attractive to children.

This invention has been patented by Mr. John B. Nichols, of 43 King Street, New York city.

HOBBY HORSE.

The hobby horse herewith shown can be propelled by working or rocking it up and down, and can be steered easily. The rear end of the reach, A, is provided with a rigid cross piece whose ends are bent upward to form standards in which the axle is journaled. This axle is bent to form a crank part connected by a rod, L, with the rear part of the horse body, which is pivoted about at its center of gravity on the standard, H, projecting upward from the reach. To the hoofs of the front legs is secured a plate to the under side of which a forked plate, K, is pivoted, the prongs projecting toward the front and having their ends bent to form eyes for receiving the cross piece of a connecting frame, I, having its opposite end pivoted on the crank part, M, of the front axle, journaled in standards projecting from the ends of a frame, P, pivoted to the front end of the reach in such a way that it can swing laterally. Cords secured to the ends of the plate, K, are passed through rings in the bridle, and then form reins.



SPITZNASS' HOBBY HORSE.

The wheels are all rigidly mounted on the ends of the axles. By rocking the horse, the crank axles and wheels are revolved and the vehicle propelled. By pulling the cords the plate, K, is swung toward the right or left, and the frame, P, is turned with it, thus guiding the horse. Steering the vehicle does not interfere with its being propelled.

This invention has been patented by Mr. William Spitznass, of New Athens, Ill.

A Day for Tree Planting.

The conservation, so far as possible, of such timber land as we have left, and the encouragement of tree planting in other places, has been earnestly urged by far-seeing men for a score or more years past. To say nothing of the direct value of the wood itself —hitherto so abundant with us as to lead to every sort of waste—the effects of tree growth on the climate and in the prevention of freshets are admittedly so great as to make the subject one of the first importance, to which people are becoming awakened in proportion to the rapidity with which our native forests are being destroyed.

Among the most practical of the means urged for encouraging tree planting, in such a general way as shall be productive of national good, the making of a special holiday therefor, to be called "arbor day," seems to be a popular idea. This was first done in Nebraska, about a dozen years ago, and her heretofore almost treeless prairies have gained 250,000 acres of artificial woodland as the result. Several other States now have an "arbor day" the dates of which are annually proclaimed by the Governors thereof; and under the impetus thus given to tree planting, large areas are at present covered with an artificial growth in Dakota, Iowa, and Minnesota. April 16 was "arbor day" in Pennsylvania, and was generally celebrated by tree planting throughout the State, especially by the school children. In New Jersey, New Hampshire, Massachusetts, and Connecticut, a similar day was also observed, though not so generally, but the idea has been received with favor, and the custom promises to take root.

We have no schools of forestry, such as there are in Europe, but the National Bureau of Education has recently issued a circular on this subject, more especially intended to encourage the planting of trees in school grounds, and by school children, but also calculated to promote the lining in this manner of public highways; its contents are such, likewise, as to impress upon all the importance of doing something toward raising an artificial growth to counteract our present enormous drain upon the original forests. Well wooded as the whole country once was east of the Mississippi River, we can now almost foresee the period when, at our present rate, timber will be very scarce and costly. West of the Mississippi the tracts destitute of timber, the almost sterile wastes, are far larger than most people have a clear idea of. They embrace a large portion of Arizona, New Mexico, Colorado, Utah, Nevada, Wyoming, and also parts of Kansas, Nebraska, and Oregon. Any general movement to promote tree planting throughout the older States should be emphasized in these almost treeless sections, where an increase in forest growth would undoubtedly diminish the regions of droughts, and lessen the force of the terrible cyclones now so frequently experienced there. Trees increase the rainfall, but prevent flood; they mitigate the rigor of winter, and stop the progress and ferocity of storms; and, though tree culture seems so slowly remunerative, some of our best informed agriculturists and economists look upon tree planting as, in the end, among the best paying of investments which owners of land can make.

Interesting Low-Temperature Experiments.

In the course of a recent address by Mr. J. J. Coleman, president of the chemical section of the Philosophical Society of Glasgow, he mentioned the following:

At about —86° C. the flesh of animals, such as mutton, becomes so exceedingly hard that it rings like porcelain when struck with an iron instrument, indeed crushes by the blow of a hammer into a fine powder, in which muscle, fat, and bone are intermingled; and, what is still more singular, according to the experiments of myself and Prof. McKendrick, recently communicated to the society, it appears that microbia alive in the flesh before the freezing operation can be detected still alive after thawing, even after exposure to —86° C., or —133° F., for one hundred hours—this pointing out to potential animal life in the solid state capable of being brought into activity by heat and by moisture, just as a dry pea shoots into activity by heat and moisture of the soil and the heat of the sun.

Leveling a Turret Bed.

An interesting application of machine power has been carried out on board the turret ship Hecate. From the deflection of the ship by the heavy weights of the guns and turrets, the beds of the turrets, or planes on which they rotate, have got out of line, and it has been found necessary to resurface the fixed beds. To have taken off the turrets and resurfaced their beds would have cost a considerable sum. To avoid this, steam has been got up in one of the boilers, and the engines which drive the turrets have been worked so as to make the turrets revolve at a very slow rate. Fixed to the turrets is a tool held in a slide like a slide rest. The edge of the tool is brought into contact with the fixed bed, and thus made to plane the bed and restore it to its original evenness.