PERPETUAL MOTION.

NUMBER XI.

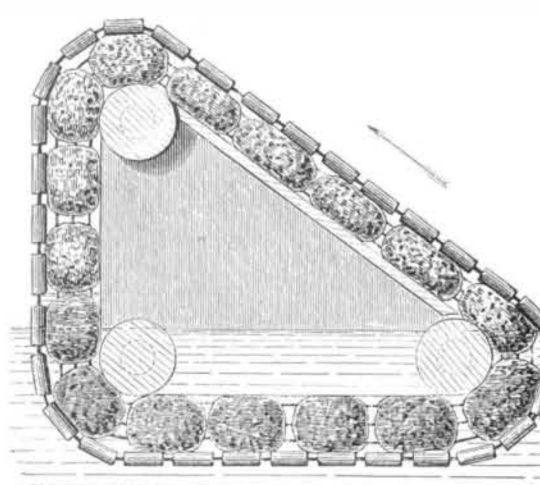
No less a person than Sir William Congreve, M. P., and inventor of the famous Congreve rocket, figured in his time as a believer in, disputant upon, and inventor of a perpetual motion. So sure was he that he had discovered the long sought principle upon which self-moving machines could be constructed, that he patented his device, although we believe he never claimed to have succeeded in getting it to work. Nevertheless, he obstinately maintained that it would work, in spite of the mathematical demonstrations, of the absurdity of his views, made by several eminent mathematicians.

Fig. 28 shows this device. As will be seen, it is based on a principle hitherto not mentioned in this series of articles, viz: the power of capillary attraction.

Three horizontal rollers are fixed in a frame; an endless band of sponge runs round these rollers, and carries on the outside an endless chain of weights, surrounding the band of sponge, and attached to it, so that they must move together; every part of this band and chain being so accurately uniform in weight that the perpendicular side will, in all positions of the band and chain, be in equilibrium with the hypothenuse, on the principle of the inclined plane. Now, if the frame in which these rollers are fixed, be placed in a cistern of water, having its lower part immersed therein, so that the water's edge cuts the upper part of the rollers, then, if the weight and quantity of the endless chain be duly proportioned to the thickness and breadth of the band of sponge, the band and chain will, on the water in the cistern being brought to the proper level, begin to move round the rollers in the direction of the arrow, by the force of capillary attraction, and will continue so to move.

On the perpendicular side of the triangle, the weights hanging perpendicularly alongside the band of sponge, the band is not compressed by them; and its pores being left open, the water, at the point where the band meets its surface, will rise to a certain hight above its level, and thereby create a load, which load will not exist on the ascending side, because on this side the chain of weights compresses the band at the water's edge, and squeezes out any water that may have previously accumulated in it; so that the band rises in a dry state, the weight of the chain having been so proportioned to the breadth and thickness of the band as to be sufficient to produce this effect. The load therefore, on the descending side, not being opposed by any similar load on the ascending side, and *the equilibrium of the other parts n t being disturbed by the alternate expansion and compression of the sponge*, the band will begin to move in the dirction; and as it moves downwards, the accumulation of water will continue to rise, and thereby carry on a constant motion, provided the load be sufficient to overcome the friction on the rollers.

FIG. 28.



Now, to ascertain the quantity of this load in any particular machine, it must be stated that it is found by experiment that the water will rise in a fine sponge about an inch above its level; if, therefore, the band and sponge be one foot thick and six feet broad, the area of its horizontal section in contact with the water would be 864 square inches, and the weight of the accumulation of water raised by the capillary attraction being one inch rise upon 864 square inches, would be 30 lbs., which, it is conceived, would be much more than equivalent to the friction of the rollers.

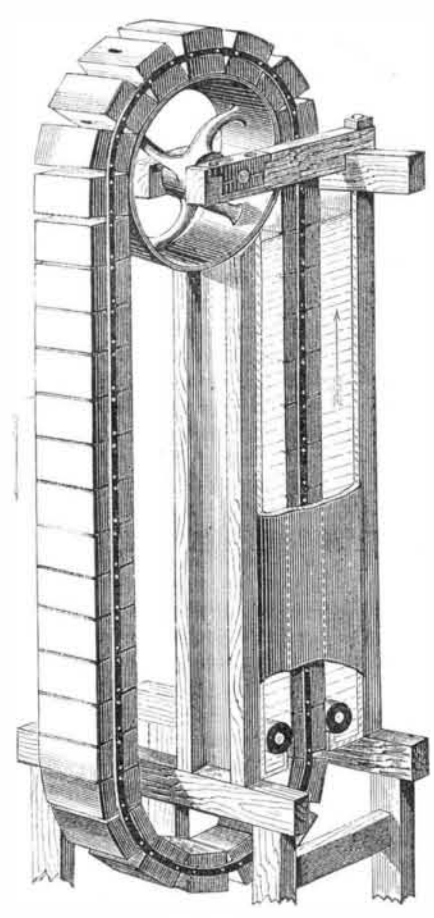
Now, the fallacy in this plausible argument is found in the words italicised. The equilibrium of the parts of the chain *is* disturbed at the moment the chain moves downward to compress the ascending file of sponges, and just enough disturbed to counterbalance the increase of weight on the perpendicular side. It is somewhat astonishing that a man of Sir William Congreve's ability, should not have seen this at once, and still more astonishing that he should have disputed it when pointed out to him, which he did vehemently. Writing upon this subject, he says:

"For my own part, not being able to see any reason why the machine should not act, I confess that my faith is sufficiently strong to have induced me to take out a patent, and I am determined to use my best exertions to give mankind the benefit of this discovery, should it turn out, as I sincerely believe it will, a so..ce of perpetual power without expense."

Fig. 29 is a diagram sent us by Mr. Wm. B. Cooper, of Philadelphia, who writes as follows in regard to it:

"Having seen in your issue of 7th Jan., a diagram of an attempt at perpetual motion, by H. Leonhart, I send you the enclosed diagram and description, which appears to me to correct the errors in his. The diagram represents an upright tank, through which passes a number of floats connected by a band of elastic rubber attached to their ends, leaving just enough space between them to secure action on each by the water. They are each of the same weight as an equal bulk of water at the surface, therefore the upper one in the tank

FIG. 29.



has no comparative weight. The next lower one has a unit of upward force, equal to the condensation of its bulk of water, and so on, each adding a unit to the upward tendency, until we come to the last, the pressure on which is altogether downward to the amount of the entire column of water; but we already have a number of opposing upward forces, and when we look on the other side and see the thirteen active weights, it seems clear that there will be a large surplus weight, over and above the opposing weight and the friction of the rollers and upper wheel.

"Of course mercury or any other liquid could be substituted in place of water.

"If you can, by the enclosed rough diagram and description, comprehend my meaning, I would consider it a special favor if you would point out the error, if any."

The mistake of this inventor is in supposing the upward pressure of the floats, added to the weight of the floats outside the tank, will more than equal the weight of a water column having a base equal to the lower side of one of the floats, and a hight equal to the depth of the tank. If the floats be made of material more compressible than water, they would tend to sink rather than rise in the tank, but if made of material less compressible, the amount of upward face which could be obtained by their compression would be far less than the weight of water in the interstices between the floats. The downward effective pressure on the lower float in the tank would be the difference between this buoyancy and the weight of water in the interstices between the floats. The weight of the floats outside the tank is exactly balanced by the downward pressure of a bulk of water equal to that displaced by the floats in the tank, therefore if any motion should take place at all, it would be in an opposite direction from that expected, and would only continue till enough water had passed out of the bottom of the tank to bring the parts of the machine in exact balance.

W. MATTIEU WILLIAMS ON THE BESSEMER PROCESS.

From Nature.

In the first place, the pig iron is melted in a suitable furnace, usually in that form of furnace known as the "cupola." The melted iron is run from this by means of movable troughs into the "converter," which is a pear-shaped spouted vessel, lined with fire-clay, "ganister," or other refractory substance.

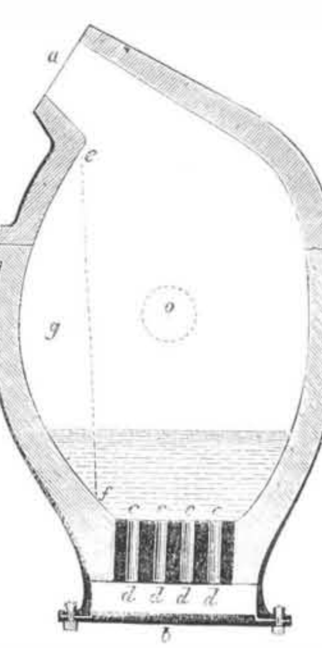
This pear-shaped vessel is truncated at the lower end, and thus a flat circular bottom is formed. This bottom, which is readily detached and renewable, is fitted with longitudinally perforated fire clay cylinders, shown in section at *cd cd cd cd*, each perforation or clay tube being about one half or three quarters of an inch in diameter, and all communicating with the space, *d d*, into which opens the blast tube from a powerful blowing engine. The number of these blast holes varies from fifty or sixty to a hundred or more, according to the size of the converter.

The converter is mounted on trunnions so arranged that it may turn on a transverse axis crossing about the middle of the vessel, as shown by the dotted circle, *o*, The turning is effected by hydraulic machinery, controlled by levers readily worked by a man who stands on a platform in full view of the converter. In order to receive the charge of melted iron, the converter (the lining of which has been previously raised to a bright-red heat) is turned over so that the dotted line, *e f*, becomes horizontal, and corresponds to the surface of a full charge. The belly, *g*, of the converter is so curved that it shall in this position retain the whole charge without any of it reaching the blast holes at *f*, or the mouth at *e*, and yet allow the whole charge to be readily "teemed" by turning the converter a little further down.

When the full charge is thus received in the belly of the converter, the blast is turned on, after which the converter is turned to the upright position, as shown in the figure, and the melted metal then stands directly over the perforated bottom. All the fluid metal above the openings is now resting upon a bed of air, and is only prevented from falling through by the blast being maintained at a pressure exceeding the falling force of the column of liquid above it. It would fall through these orifices into the blast-way and do serious mischief should the blast be stopped or slackened for an instant, or should the converter be turned upright or overcharged, before the commencement of the blast. An accident of this kind but rarely happens, though it is by no means an unknown casualty.

The "blow," as it is termed, now commences; the hundred streams of air tear through the pool of melted iron, and a huge flame roars furiously from the mouth of the converter. At irregular intervals magnificent cascades of brilliant coruscating sparks are belched forth, and the dazzling spray as it dashes against the walls of the flame shaft rebounds with redoubled splendor, each glowing globule being shattered by the shock, and bursting into rescintillating fragments. The loud-bellowing blast roars on monotonously, but the flame becomes brighter and brighter continuously, and grows in length and breadth as it increases in brilliancy, until at the end of about ten minutes it attains its maximum, when its splendor is painful to the eye, and yet so fascinating that few who see it for the first time can turn their dazzled eyes away. The spark eruptions still burst upwards from time to time, and still dash against the brickwork and the ground, and still reverberate in fiery splinters, but their appearance has changed. They are now no longer red hot, or yellow hot, or white hot, but have a curious purple luminosity different from anything one has ever seen before. If it be day time, and the sun shining, the sunlight out of doors has a sickened partial-eclipse aspect when viewed directly after gazing at the flame, and at night the ordinary gas lights appear red and smoky.

After five or ten minutes continuance of this maximum splendor, the flame is seen to contract somewhat, and presently the ponderous vessel turns a very deliberate summersault, the flame disappears, but the uninitiated spectator is startled



by a new display; for as the converter rolls smoothly over, it disgorges a continuous stream of sparks which its rotation spreads out in a fan-shaped volley, extending from end to end of the building, and reaching the roof, descends in a broad sheet of fiery hail. This is the transformation scene which concludes the first part of the performance; for now the dazzle of the flame and the roar of the blast ceases, and a general lull intervenes.

The trough from the cupola is now swung round to the mouth of the converter, a red glow is seen to creep along it, and starry sparks dance above as it advances. This is the spiegeleisen coming from its cupola by the same path as conducted the main charge. The spectator should now change his position, and, if possible, find a standing place from which he may look into the mouth of the converter. At first he will distinguish nothing but a yellow glare, but by steadily fixing his gaze, he will presently, and rather suddenly, distinguish the surface and limits of the pool of melted metal. He will see that as the spiegeleisen pours into it, a furious ebullition takes place. At the same time a great mass of pale blue flame issues from the mouth of the converter, but with a quiet, leisurely waving, that contrasts curiously with the previous roaring jet of white flame. This flame has but very little intrinsic luminosity, yet at night it lights up all the surrounding objects with a singular brilliancy, a sort of exaggerated theatrical moonlight effect, which is the most remarkable to a spectator outside, who, on a misty night, sees the long streams of ghostly light pouring through every opening of the building in pallid beams that, under favorable conditions, may be traced for above a quarter of a mile. I have seen them projected in bright disks upon the face of low clouds, and visible through the whole of their intermediate course.

When the flow of spiegeleisen has ceased, the trough is moved aside and a large counterpoised arm bearing the "ladle" is swung round upon a hydraulic piston, which forms at the same time its axis and lifter. The ladle, a large lined iron pot, is adjusted under the mouth of the converter, which is now tilted a little more, till the melted metal is poured out in a thick brilliant white-hot stream, accompanied from time to time with great slabs of cinder of a darker color, which float upon its surface as it pours, and form a thick scum covering the contents of the ladle. When all the fluid metal is poured into the ladle, the converter is tilted over till completely inverted, and the remaining viscous mass of cinder drops out in a glowing heap upon the floor.

During these proceedings a set of workmen have been preparing the molds in which the ingots of steel are to be cast. These molds are of cast iron, nearly cylindrical, being larger at bottom than top, and open at both ends. They have lugs or handles at top by which they are lifted. They stand upon a tile, and are well packed round the bottom with sand to prevent the outflow of the melted steel. While the blow was proceeding these were arranged in an arc of a circle whose radius exactly corresponds with the length of the arm bearing the ladle.

The ladle is now swung round and adjusted till it stands directly over the first of this row of iron vases, and a plug is released, by which a hole in the bottom of the ladle is opened. Through this the steel is poured into the ingot. When the first is filled, the plug is closed, the ladle swung round to the second mold, and so on, till all the steel is thus cast into ingots, the size of which varies with the kind of work for which the steel is required. A thin steel plate is placed on the top of each casting immediately the mold is filled, and over this a bed of sand is placed, and speedily and firmly pressed down.

As soon as the ingots have solidified, and while they are still glowing, the molds are lifted off them by means of a hydraulic crane, and afterwards the ingots are picked up by tongs attached to the same machinery, and are carted away, all red hot, to the hammer shops, where they are thumped and rolled or otherwise tortured into their required forms of rails, tires, and plates.

Japanning on Metal, Wood, and Paper.

Japanning on metal, wood, and paper is executed in much the same manner as similar works in spirit or oil varnishes, except that every coat of color or varnish is dried by placing the object in an oven or chamber called a stove, heated by flues to as high a temperature as can safely be employed without injuring the articles, or causing the varnish to blister or run. For ornamental works, the colors ordinarily employed by artists are used; they are ground in linseed oil or turpentine, and are afterwards brought to a proper consistence for working by mixing them with copal or anime varnish. The latter is generally used, as it dries quicker, and is less expensive than the copal varnish.

For black japanned works, the ground is first prepared with a coating of black, made by mixing drop ivory black to a proper consistence with dark-colored anime varnish, as this gives a blacker surface than would be produced by the japan alone. The object is then dried in the stove, three or four coats of japan are afterwards applied, and the work is dried in the stove between every coat. If the surface is required to be polished, as for the best works, five or six coats of japan are necessary, to give sufficient body to prevent the japan being rubbed through in the polishing.

For brown japanned works, the clear japan alone is used as the ground, or umber is mixed with the japan to give the required tint, and the work is afterwards dried in the oven, in the same manner as black japan.

For colored works no japan is used, but they are painted with the ordinary painters' colors, ground with linseed oil or turpentine, and mixed with anime varnish; and the work is dried in the oven in the same manner as the black japan.

To protect the colors, and give brilliancy and durability to the surface, the work is afterwards varnished with copal or anime varnish, made without driers. Two or three coats of varnish suffice for ordinary works, and five or six for the best works that are polished. Very pale varnish is of course required for light colors.

Ornamental devices are painted on the objects in the usual manner, after the general color of the ground has been laid on. The colors are dried in the stove, and the work is finally varnished and polished just the same as plain colors, but more carefully.

Metal works require no other preparation than cleaning with turpentine, to free them from grease or oil, unless the latter should happen to be linseed oil, in which case the cleaning is generally dispensed with, and the articles are placed in the stove and heated until the oil is baked quite hard.

Wood that is intended to be used for the best japanned work, requires to be thoroughly well dried before it is made up, or otherwise it will be subject to all the evils of shrinking, warping, and splitting, when exposed to the heat of the stove. To avoid these evils, the wood, after having been well seasoned in the usual manner, by exposure to the air, is sawn out nearly to the required forms, and baked for several days in the japanner's stove, the heat of which is gradually increased; and the wood is afterwards worked up into chairs, tables, trays, and similar articles, which are afterwards again exposed to the heat of the stove, and any cracks or other imperfections, that may be thus rendered apparent, are carefully stopped with putty, or white lead, before the japanning is commenced.—*Handbook for the Artisan, Mechanic and Engineer.*

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

The Destructive Action of Albumen--Its Remedy

MESSRS. EDITORS:—On page 81 of your valuable journal, the question is asked: What is the secret of making black (carbon) ink free from any disintegrating or perishing ingredients? Permit me to answer the question, not only in relation to black carbon ink, but to many other materials that labor under the same or similar difficulties.

The carbon in the black ink is not subject to decomposition, but some of the ingredients added to it are; these ingredients are not free from albuminous matter, hence the decomposition. It certainly is singular that cause and cure should have remained a secret until recently; but the fact has been satisfactorily proved at last, that all crude organic substances contain albuminous matter.

Animal organism takes the albumen ready formed into its nourishment, but vegetable organisms cannot, of itself, assimilate the albumen; out of its constituents, the vegetable albumen is formed in the system of the plant, in which it appears invariably combined with glutin and other substances, as vegetable gluten. (This, by the way, may be the true definition of animal and vegetable organism.)

Albumen is a necessary part in all organism, which cannot form or exist without it or its constituents. But life having ceased, the nitrogenous albuminous parts are the true basis of decomposition under ordinary elementary exposure, by their superior tendency to oxidize and to give support to microscopic organism, whose presence involves the several states of decomposition, termed fermentation, putrefaction, and decay. As the presence of microdermic organism and the albumen required for its nourishment are necessary conditions for elementary decomposition, an easy conclusion leads us to the essential condition of stability: the removal of the albuminous matter, which forms the support of destructive organism.

Albumen is a colorless substance, soluble in water. Animal and vegetable albumen are identical; they differ in the association in which they appear, and in the superior tenacity of the vegetable compound to maintain the association.

An erroneous statement, which we meet in all books on the subject, requires correction, as it leads to the incorrect conclusion that albumen may be removed, from liquids, in a coagulated state by mere heating. Crude animal albumen readily coagulates at about 160° Fah.; the erroneous conclusion is drawn that *all* albumen thus coagulates. Vegetable albumen in the form of gluten requires other conditions than mere heat for a separation preliminary to a coagulation. Simply boiling heat, continued for many hours, only produces a partial removal of the albumen from vegetable juices or extracts; for instance, saccharine or oleaginous juices of any kind, such as beerwort, the saccharine extract from malt. However, other agencies assist the coagulation of the albuminous parts at lower temperatures, even little above 32° Fah.

The very nature of the albuminous compounds, and that they form the basis of all elementary destruction of organic substances, being unrecognized, all operations with these substances remained something like empirical attempts to accomplish a resistance against unknown agencies, and the manufacturing operations improved slowly. A recognition of the all-governing principle in organic matter permits the deduction of the proper mode of treatment.

The agent, by which the albumen can be separated and removed from any crude organic substance, without injury to the other compounds, or by which it can be retained in an innocuous condition, is the air we breathe.

Intelligently applied, it enables us to meet all the difficulties successfully. Rapid passage of air through liquids or over an organic substance produces traces of ozone, that is, oxygen in an excited, highly active condition. (Ozone is produced in large quantity by electric action, by blowing of air through a flame, etc.) Want of ozone in air is destructive to dead organic matter, the slow access or quiescent contact of air favors putrefaction; rapidly-moving (ozonized) air, on the contrary, destroys the organism which causes putrefaction. It seems to act also essentially upon the albuminous matter, separating it from its compounds, and, by coagulating it, to render it innocuous. At a temperature favorable to an alcoholic or curing fermentation, this process is at the same time improved, by invigorating the mycoderms, to whose flourishing condition the fermentation is due. As soon, however, as the albuminous parts are entirely coagulated, the mycodermic action must necessarily cease for want of the required aliment, the soluble albumen.

Every part of a fluid, or of solids immersed in fluids, is uniformly acted upon, by impelling the active gas in a divided state through the fluid, in which a mechanical commotion with the chemical action is produced; or, the air or gases are made to circulate, freely and rapidly, about solid substances whose preservation is intended.

Mycodermic life is suppressed in vegetable matter, at a temperature above about 135°. The albuminous parts may thus be eliminated from vegetable fluids, with exclusion of fermentation, by currents of air through the fluid, heated above 135°; the action is more vigorous at a still higher temperature, and the action, of the atmospheric oxygen or other gases, greatly intensified at a higher than the ordinary atmospheric pressure.

No chemical can prove of universal use for purification; what improves one injures other organic substances, while air, the principal source of all organism, benefits all alike. The practical application, in the manner explained, of the universal principle, is termed, by the Californian discoverer of both, the d'Heureuse's Patent Air Treatment, and the fact that the application is patented cannot detract from the truth of the principle involved. It appears to be of universal applicability in the manufacture of sugars, oils, glue, gums, wine, cider, beer, spirits, and in the preservation of meat, produce, hides, etc. It certainly is simple, effectual, and subject to the control and comprehension of the most ordinary intellect.

The ingredients for black carbon ink are generally crude gums, or other crude organic matters, not free from albuminous parts, and decomposition of the whole compound takes place of necessity. R. D'HEUREUSE.

New York city.

Sirups.

MESSRS. EDITORS:—The explanation of Prof. Chandler, as recently quoted in the SCIENTIFIC AMERICAN, of the formation of sirups from refined sugars, I do not dispute. Such sirups are what they should be. I venture to assert they will not blacken the teeth. But the "golden sirup" made from starch and sulphuric acid is an imitation of these. That iron should necessarily occur in glucose sirup, is not true; but I contend that all I have examined did contain it, which I suppose was caused by the long continued action of the acid, upon the iron vessels in which the sirup is made, forming a solution of sulphate of iron (common copperas). When the manufacturers use other material, the test for iron may prove useless. Troemner's test for glucose can then be used. I don't wish to be understood as condemning glucose sirup. My purpose is only to give, to those who prefer cane sirup, the opportunity of distinguishing it. If the drippings of cane sugar contain iron, the sugar would exhibit like characteristics. I have applied the test for iron to cane sugar and molasses, and found none. The action of boiling cane juice, neutralized as it is by lime, has little effect on the kettles, as tests show. Under the circumstances, I say cane sirup, as now made on plantations in Louisiana, does not contain iron to an appreciable extent, blacken the teeth, or produce a burning sensation in the stomach, and that which does may fairly be supposed something else.

New Orleans. JOHN H. POPE.

Coal-Cutting Machine Wanted.

MESSRS. EDITORS:—The interest you take in improvements induces me to call your attention to the question whether machinery, or mechanical appliances, that will facilitate the mining of coal, thereby rendering operators less dependent on the miner, and relieving the consumer of coal from the high prices and fluctuations in consequence of strikes, cannot be invented. Now is a good time to call attention to a question of this kind, when 100,000 miners are on a strike, for no good cause, paralyzing all branches of manufactures that use coal for fuel.

I am operating in the Block coal field, of Clay county, Indiana. The vein of this coal is from three to five feet thick, and there are seams running through the vein every twelve to twenty-four inches, that make it very easy to mine. No blasting is necessary in this coal. All the miner has to do is to make a bearing-in with his pick, at the bottom of the vein, of from eighteen to thirty-six inches, when the coal is easily split out with wedges, the seams making this easy to do. If a machine were invented that would do this bearing-in, one miner could do the work of four or five. This would not reduce the demand for labor, as the demand for this Block coal is ten times ahead of the supply, as all the railroads that can get it are using it in preference to wood.

The inventor who constructs a machine that will mine this coal can make a good thing out of it, as every operator will want one or more for every room he has opened.

Indianapolis, Ind. J. R. ELDER.

[Patents have been taken for machines for mining coal, but we have not heard of their being introduced.—EDS.

Motive Power for Western Farmers.

MESSRS. EDITORS:—On page 49, current volume, of the SCIENTIFIC AMERICAN, is an article headed "Another Motive Power," which has set me to thinking that the new motor might be used more extensively than you there intimated.

The farmers of the great western plains are sadly in need of a new motive power. Agriculture has taken the first rank among all human pursuits; yet the farmer of the nineteenth century, the age of steam and telegraphy, plods along as his ancestors did, two thousand years ago, relying on the same forces, with this difference only: the modern farmer uses improved machinery.

But all machines require the application of force to make them move; and the only force at the command of the ordinary farmer, animal power, is expensive and inadequate. Put the farmer in possession of such a power as he demands, cheap and efficient, and we shall see as great a revolution in agriculture as has followed the introduction of steam to commerce and manufactures.

If compressed air can be made as efficient a power as steam, I propose that the farmer erect windmills to compress reservoirs of air, from which he could draw supplies to work engines, to drive his threshing machine and corn sheller, as well as to grind his tools, churn his butter, and wash his clothes.