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THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 490,

For the Week Ending May 23 1885.

Price 10 cents. For sale by all newsdealers.

COMPRESSED AIR FOR SMALL MOTORS.

A correspondent revives the idea of driving light machinery, requiring less than one horse power, by means of compressed air.

The first essential feature is the means for compressing the air, and this he proposes to accomplish by a windmill.

The air receiver he proposes to construct capable of sustaining a pressure of 3,000 pounds to the inch. Its size will depend upon the use to which it is to be put. For storing air for driving a one horse vehicle for several hours, a cylinder 4′ x 2′ would be ample.

We thus have a reservoir of force on which we can draw at will, and one which is applicable to a multitude of domestic purposes.

In the case of light vehicles, they may be constructed, let them be observed, with no less beauty than if intended to be dragged after a horse. The rear axle is made to revolve freely, and is provided with a crank at its center. Both wheels are attached rigidly to the axle, or, in order to facilitate turning, one may be left loose, according to the practice of steam fire engines. The forward axle is provided with suitable upright and handle, to direct the course of the carriage. The cylinder of compressed air, which for a light load need not exceed 3′ x 9″, is placed upon the wagon body, and will accomplish two and a half hours' propulsion, having at the end of this time a residual pressure of 500 pounds. Where the absence from the source of supply will be longer than this, two cylinders, or one of double capacity, may be used. The weight of each cylinder will be about 85 pounds, and double this weight, or if only one large one be used, somewhat less than double, will be no more than the weight of an extra person, the physician's coachman for example.

The connection of the engine, borne by the cylinder, with the axle crank is either direct or by intervening gearing. Where two cylinders are used, they are both connected with the receiver of the engine.

The advantages presented by this system over animate motors are so undeniable that eventually it must supplant them to a large extent. It is admirably adapted for daily service in a hundred different ways. Its first great virtue is the saving of the cost of maintenance. A horse is a continual bill of expense. Whether used or not, it must be daily fed and cared for; whereas our windmill requires only a very light diet of lubricant, and is docility itself. Nor is it apt to grow sick and die. Blankets, hitching straps, and whips will not be called into requisition.

In all previous traction engines, it has been necessary to provide for the great weight of a boiler and its appendages, and we have had consequently a cumbrous mass of machinery ill suited for ordinary use. With compressed air we add no more than the weight of a driver, and our wagon runs off as lightly as at present.

While we have considered only the case of light vehicles, the system is none the less applicable to heavy trucks and drays. The added weight in the latter case need not exceed 450 pounds, and this would be more than compensated for by the saving in expense and the absence of horses from our crowded streets.

There appears to be a wide field for the exercise of inventive genius in the production of compressed air motors and vehicles thereby operated.

GRAIN IN CAST IRON.

There is cast iron that is so fibrous that a turning chip of twenty feet long has been nursed from a shaft in the lathe, but this iron was of exceptional quality, and was used for the making of a steamboat shaft before forged iron shafts were common. Ordinary cast iron has no fiber—none worthy the name. It is of a granular or cellular structure, and is a conglomerate of material of which iron proper is only one portion. But iron may be so refined, by selection and mixture of ore products, as to present a structure of cells so minute as to be capable of a polish and burnish resembling steel.

This excessive refinement is not always an improvement. A series of experiments in cast irons, comprehending the mixture of the irons, the requirements of heat and fluxes, and the quality of the fuel, shows that for ordinary purposes the reduction of the cellular structure to an approximation to homogeneity is not advantageous; for finish pieces and ornamental work, as the aprons of lathes, and for gear blanks which are to be exposed, and for similar purposes, iron that will receive a silvery luster when polished is excellent; but such iron is devoid of the quality of tension and recuperation—the more open cellular iron will yield and recover better than the closer iron.

For heavy castings, like planer beds and lathe beds, the more open iron is the better; it is less liable to come out of the mould chilled and hardened in spots, and it has a tenacity under severe strain that is not equaled by the finer iron. The mottled color of such iron after being planed sometimes troubles the machinist, who wants to make a good job out of the best materials. The writer's opinion was recently asked in regard to this matter. An eleven ton planer bed had been prepared for setting up, and the recessed V-ways showed a mottled surface—gray and black—as really good soft iron frequently does. It had been suggested that the dark cellular spots were holes where the grain of the iron had been torn out in planing—taking a rank feed for finishing chip. Of course, this was impossible, and yet the open structure of the iron, that was exposed only after the casting skin had been removed, gave the impression of a honeycomb rather than of a solid.

If this structure of the material is not the most elegant when finished, it is absolutely stronger than the closer grained qualities of iron. And it is claimed by some builders of heavy tools that wearing surfaces of such iron are more durable and run easier than those of closer grained iron—that the oil fills the cells, producing and maintaining numberless minute reservoirs of the lubricant. "What sort of a planer bed would fine machine steel make?" asked an intelligent foreman. "There would be required a barrel of oil with drip pipe at each end, as the platen moved." Probably the grain of cast iron and the uses to which it is to be put should be inseparable considerations.

THE TEETH OF MILLS.

A suggestion that the teeth of reamers could be wisely reduced from the wide flutes so common was made several months ago. Further observation is to the effect that most of the milling machine cutters have teeth too few for their diameters. In shop practice it does not appear to be the rule that the diameter of the mill has any relation to the number of its teeth—the idea appears to be that from root to point the length of a milling tool tooth should be from half an inch to one-fourth of an inch; this without any regard to the diameter of the mill, or the circumferential speed at which it was to run, or the difference of the material on which it was to act.

In a shop of considerable pretensions was noticed a workman attempting to dress a cast steel blank in the milling machine by a mill with teeth of three-eighths of an inch long—the blank being on a vertical arbor and fed up against the teeth of the mill, which was on a horizontal arbor. It was a futile attempt. The workman sprang the upright arbor, and broke out a tooth of the mill. When he was asked why he attempted the job of steel against steel with such a tool, he said that he had dressed brass blanks so the week before. So he had; but they were brass. Brass requires coarse cutters; files for brass should be coarse cut—wide teeth. But for steel the mill should have been very fine toothed.

A coarse toothed mill should revolve very rapidly, or else the feed must be very slow; whereas a fine cut mill may go slow with quite a rapid feed. If the trouble of keeping the mill clean is not taken into account, more rapid work, as well as better work, can be done by the fine tooth mill than by the coarser one. And even then there is not much saved; the workman must attend to his milling machine—it does not feed itself, however much it may run a job through unattended.

It would be well for some competent machinist to prepare a table of diameters of mills with relative sizes (numbers) of teeth, and their adaptation to the work (material) on which they were to be used. It would not be a difficult classification, and might be of great benefit.

EXPECTED ADVENT OF THE LOCUST.

According to Prof. C. V. Riley, the U. S. Entomologist, we are to experience this year a very extended appearance of the insect known as the Periodical Cicada, *alias* the "17 year locust." Prof. Riley, who has made many original observations on this insect, and who 17 years ago published an account of twenty-two distinct broods, and first announced that there is a 13 year race of the species, states that we shall witness this year the conjunction of two distinct broods, one a 17 year and the other a 13 year brood.

It is 221 years ago, or in 1664, since these two broods appeared simultaneously. The 13 year brood is located principally in the Mississippi Valley, reaching up as far as the mouth of the Missouri, and having its thickest centers in Union County, Southern Illinois, and in Kansas, Missouri, Georgia, Louisiana, Tennessee, and Mississippi.

The 17 year brood is one of the largest of all those known to occur, and will appear on Long Island in Kings and in Monroe Counties, New York, at Fall River, in the southeastern portion of Massachusetts, in parts of Vermont, and very generally in Pennsylvania, Maryland, District of Columbia, Delaware, and Virginia, also in Northwestern Ohio, in Southern Michigan, in Indiana, and Kentucky.

This curious insect, according to race, remains either for 13 or 17 years under ground, developing slowly, and sometimes burrowing far below the frost line. Prof. Riley says that they will begin to rise from the ground about the latter part of May in the more southern portion of the country and early in June in the northern portion, and that the woods will resound with the hoarse rattling noise which the males make, the females being noiseless, a fact which the Rhodian bard Xenarchus recorded in his couplet:

"Happy the Cicada lives,
Since they all have voiceless wives."

The 17 year brood that is to occur this year has been