Steam versus all other Gases.

This has become a very important subject of late; and when we see such men as Ericsson, in America, and Du Tremblay, in France, spending thousands of dollars to find a substitute for steam, we are bound to believe that the subject is not well understood by all scientific men.

The steam engine was at first called an atmospheric engine, because the inventors were trying to give motion by the pressure of the atmosphere, and only used steam in one end of the cylinder. After the improvements of Watt, it was called a steam engine, because he admitted steam to both ends of the cylinder. Would it not be well to change the name once more, and call it a "Caloric Engine," for it is caloric and not steam that gives life and motion to the machine. Viewing steam as the motor, is the cause of many naturally turning their attention to other fluids more volatile than water, and requiring so much less latent heat to convert them into vapor—such as ether, alcohol, oil of turpentine, &c. The cost of these fluids would be an insuperable objection to their use, for although the vapor might be condensed, and the fluid worked over continually, yet no machinery can be made so perfect that the loss would not be considerable. But it can be shown that there is no advantage in using them, if they were as cheap as water, for the volume of vapor is in exact proportion to the latent heat required to form it. The latent heat of ether is 300 deg., less than one-third that of water, and accordingly we find the vapor of ether occupying less than one-third the space of steam. The same is true of every other vapor. The heat required to vaporize a fluid being the exact measure of the volume of that fluid. In aeriform matter, the atoms are forced so far asunder as to destroy cohesive attraction; we do not know what this distance is, but it is less than one-third for ether, as compared with water, and still less for some other substances. This property of matter depends upon the cohesive attraction of the different kinds of matter, and not on the heat, which is always the same. A similar property belongs to solid matter, in that expansibility is in proportion to compressibility; thus a bar of steel will require double the heat to produce the same elongation required for a bar of brass, but will sustain double the weight before it is forced back to its original length.

The size of solid bodies is ever varying, depending upon the amount of heat in them, and the cohesive attraction of the different kinds of matter elevate the temperature enough to destroy this cohesive attraction; and we have gas, varying in volume in proportion to the force of the cohesive attraction that existed. This gas will now, however, occupy a space limited on the one hand by heat, and on the other by external pressure. The various kinds of matter, in its three forms—solid, fluid, and gas—are acted upon variously by heat. But heat itself—sensible, latent, or specific—like gravitation, is always the same. The only possible advantage of using any of these volatile fluids would be, that the engine might begin to play a little sooner, just as we can load a small vessel sooner than a large one; but to make their vapor occupy the same space, or expand with the same power as steam, the same amount of heat must be used, except a small advantage, in the heat being more occupied in expanding than making gas.

Atmospheric air is really the only competitor of steam, nothing else is cheap enough, it is even cheaper than water, and would be free from explosions by decomposition, as its elements are not chemically combined.

Let us bear in mind that steam once formed is equal to air or anything else,—much of the power of steam is obtained by heating it after it is formed. Now steam, air, and all gases are just alike—a volume of any of them will gain one part in three, if the temperature be raised 180 degs.—from freezing to boiling water,—no difference which gas it is, they are all alike. The advantage, then, of air or any permanent gas, is, to save a part of the heat that vaporizes the water. It requires 1000 deg. of heat to form steam, which has an expansive force of 15 lbs. to the square inch, as all gases must have. Now 500 deg. will double the volume of that steam, or any gas, giving it 15 lbs. additional force, so that if we could begin with air at once, we would save 500 deg. This does appear to be the fact.

But how are we to get the air into the boiler or heater to supply the consumption of hot air. Any temperature that the heater could stand would only be a few doubles of volume, to force back a fourth or an eighth, would be a great loss of power; nor could we afford to condense the air. True, we would get back the expansive power pressed into the air, but the friction of so large and powerful an air pump would be very great.

How fortunate that Nature supplies us so bountifully with a material that she condenses herself, if we only withdraw a little heat, compressing 1700 volumes into one, so that while in this compact form a small force pump supplies the loss, although the cylinder is throwing off great volumes of steam. Nor should we omit the power saved by condensing the steam—a process that looks more like gaining power than anything else in practical physics.

Heat is then the grand motor in the steam caloric engine. Steam, air, ether, or any fluid or gas, is nothing but the gross matter for the heat to act upon, and in our present state of knowledge, water possesses great advantages over everything else. The road to improvement is to direct our energies to the cheapest way to produce artificial heat, the best way to preserve it, and the most advantageous way to use it. J. G. H.

[For the Scientific American.]

The Mechanical Calf.

"*There is nothing* new under the sun," and I am obliged to accept your wager in behalf of old Solomon, for *supposing there might* be. To save your correspondent G. W. S., of Broome Co., N. Y., the trouble of experiments, I will state that in the spring of 1847 a dairyman by the name of Greenlee, in Crawford Co., Pa., applied to me to construct an apparatus for milking cows by atmospheric pressure, or through the medium of an air pump.

I detailed to him a variety of apparatus that I knew would extract the milk if the cows could be *broke* to the new process. I however advised him that I did not think the process could come extensively into use on account of the expense, and the difficulty of keeping air pumps in proper order in hands unused to delicate mechanical apparatus. He, nevertheless, ventured boldly into the project, and footed the bills like a gentleman for three "Patent Milkers," holding about four gallons each, having two well-constructed air pumps to each, and four elastic rubber tubes, stop cocks, &c., affording me an opportunity to expend some of my best mechanical skill for a couple of months. The apparatus was completed, and on gentle cows and easy milkers it worked beyond all my expectations, and my friend Greenlee began arranging his stables to milk his sixty cows by one great air pump, precisely on the plan detailed by your correspondent. But alas! for human hopes! the milk-maids are yet milking with their hands, and will continue to do so till some one has enterprise enough to manufacture without a patent, which was then duly applied for, model furnished, and long specifications detailing various appliances intended to cover every contingency, but the claim was rejected "for want of novelty, the same process having been applied to the human breast!" I denied the validity of the objections, as the apparatus as detailed was new and should have been patented; it was overruled, and my friend Greenlee, because he could not get a patent, neglected to milk even his own cows by machinery. I presume G. W. S. can get one of them for his experiments at half first cost, and with the thanks of one who spent some hundreds of dollars in such experiments.

Newark, Ohio. JOSEPH E. HOLMES.

The Mechanical Calf Once More.

For the benefit of your correspondent G. W. S., of Broome Co., N. Y., and all others interested, I send you the following, as my experience in milking by machinery:

I made an apparatus, seven years ago this summer, for milking. It consisted of a vessel made of thick tin, in form and size of a large watering-pot; it was furnished with an exhausting pump nicely fitted on the top by a screw joint, also a flexible tube attached to the top by a screw joint fitted on the end of a short spout, intended by removing the tube by unscrewing, as a discharge for the milk from the vessel. I had a stop cock in this spout to enable me to exhaust the vessel before applying the apparatus to the cow. The flexible tube had four branches, each branch was furnished with a thimble of size and shape to receive the teats of the cow. This completed my apparatus for milking cows by machinery; it now remains to be told how it operated.

Well, I took it out to my friend, John Rinnard, near Westchester, who was kind enough to let me try it on his cow. After exhausting the vessel I applied the thimbles to the teats and turned the stop cock. The suckers laid hold like a calf. The milk flowed into the vessel until all, or nearly all, was drawn from the cow, which required double the time it would to have milked the cow by hand.

I tried it on the same cow several times, and on different cows with the same results, and came to the conclusion that it would be of little or no use unless applied upon a large scale, as your correspondent suggests.

It is a gentle, easy way of milking, and the cows seemed to like it much, and would probably give their milk more freely after becoming accustomed to the process. On the whole, I am not satisfied that milking cannot be done by machinery. Respectfully yours,

Philadelphia, Pa. WM. H. HOWARD.

One Hundred Miles per Hour on Railroads.

MESSRS. EDITORS—In your issue of August 11, you say, "Railroad trains will yet be running at the rate of one hundred miles per hour, it is our opinion."

Instances of cars running from 80 to 100 miles per hour, cannot be news to gentlemen in your position in the community. You may not be apprised that there is now before the U. S. Senate a proposition for the construction of a "speed locomotive," which the inventor is confident will attain safely 400 to 500 miles per hour. The track is to be adapted to a peculiarly constructed locomotive, which is to be as light as may be compatible with requisite strength, to have four to six wheels ten feet diameter. The vehicle is to embrace or constitute the engine, tender, and mail department, and to carry an engine and an attendant. The object is to transport mail matter and light articles exclusively. The importance of the realization of such a result you are fully qualified to appreciate. JOHN VANBLARCUM.

Jacksonville, Ill.

[In alluding to the above remark of ours, referred to by our correspondent, the *American Railway Times* (Boston) of the 16th of August, in a very candid manner, said "there was no physical impossibility about the matter, but we doubt whether the present generation will witness any portion of the passenger traffic carried at that high rate, and the reasons are obvious. It will not pay, and the commercial question settles the question of speed. The expense of operation increases with great rapidity as the speed is increased, and the liability to danger and destruction is so greatly increased that few men feel like being hurled through the air at such fearful risk. Not until there is a radical and entire change in the superstructure and machinery used in the operation of railways, will the speed be increased to any considerable amount."

With some of these remarks we perfectly agree; with others we do not. The question of payability no doubt settles the matter, but with proper roads and machinery, higher speeds are just as safe as our present low speeds on railways. Fewer accidents take place on English railways than on ours, and yet the speed on them is a third higher. A *radical* change of road and machinery is not required for higher speeds. Level and straight lines, more solid roads, and more powerful engines, are all that is required for higher speeds—these do not involve a radical change. But higher speeds than those now adopted on our railroads will not pay excepting on lines running through very thickly peopled districts, and would not be safe under the system of railroad management generally pursued. A very intelligent correspondent, apparently an engineer, who appears to have studied the subject carefully, writing to the *Railway Times* of the 30th ult., contends that "it can be demonstrated to the conviction of any practical man, that by a simple combination of machinery in common use, a speed of 100 miles per hour can be obtained without any increase of tear and wear."

We are no advocates of a higher speed on our common railroads than that now adopted—perhaps it is a little too high for the present system; but we believe, and have asserted, that we have engineers who can build railroads and engines to run trains at the rate of 100 miles per hour as safely, though not so economically, as those running at the present speeds of from 35 to 40 miles per hour.

The Farmer's Future.

An English correspondent of the New York *Tribune*, expatiates on the prospective introduction of steam power as an aid in agricultural operations, as follows:—"The Farmers' Future will be found in the *application of steam to the cultivation of the soil!* We are rapidly coming to the conclusion here that the good old plow is a humbug. We begin to think that spade-husbandry applied by steam is the right thing; indeed, there are some among us of the opinion that a machine may be invented which should, in effect, plow, sow, harrow and roll altogether—a machine, in fact, which should make a seed-bed and sow the seed all at one operation. There has already been one steam-engine exhibited in this country which will walk anywhere, and do anything it is required to do. It has feet about the size of yours, Sir, and it puts them down upon the ground, one after the other, very much in the fashion of a dandy going up Broadway, only the feet of the machine are fixed on wheels, and revolve regularly, instead of moving up and down awkwardly, like his. This machine will go through a plowed field very comfortably, and rather quicker than a good hunter will get over it; and as it will drag a dozen plows after it, I do not see, for my part, why it should not be made to carry, as part and parcel of itself, a mechanism that will readily convert the untilled ground into a seed-bed. Well, then as to drainage. I saw a machine the other day that would dig, drain, and lay down sixteen and a half feet of piping per minute, the pipes being rather more regularly and satisfactorily laid than any skilled workman can lay them. The machine labored under the disadvantage of being cumbrous, and of being made to be worked by a stationary engine. But having got thus far, it seems to be only one step further to give us steam application to the soil so as to enable twenty times the quantity of land to be put under cultivation by the same amount of labor, and at no greater cost than now. Then we may hope for a produce of cheap corn, the great desideratum in this land of sweat and toil, where it depends upon a shilling or two, more or less, in the price of food, not only whether a man can reap the advantages of his labor, but absolutely, too often, whether he can continue to exist.

Yes, to the application of improved machinery to the earth must we look for an accession of home comforts, of world-wide prosperity, of universal happiness! To Thee! O, bountiful God of Nature, we offer our first thanks that Thou hast given us the great seed-bed whereon we live and move, and whence we have our being. To Industry be given our next best tribute, and then let us thank Art and Science that teach us how to make the best uses of the means so bountifully placed at our disposal."

A War Balloon.

Experiments are said to have been ordered at Vincennes, France, on an incendiary balloon of immense size, to see if it can be usefully employed at the seige of Sebastopol. A first experiment was made not long since, but the balloon, after being filled in the court-yard of the fortress, caught the towers in rising, and was torn open. Subsequently the balloon was repaired and again filled; but after a short time it burst open, owing to the pressure of gas from within.

Explosion of Percussion Caps.

An awful explosion at Naples occurred in the Castel Nuovo, on the 20th July, where percussion caps are made. The entire building was blown up, and it is said that at least two hundred persons were buried in the *debris*. Fearing that another revolution had broken out, the soldiers rushed to arms, whilst the inhabitants, imagining that an earthquake had happened, are reported to have run about in a frantic condition.