coals. Now 12 cubic feet multiplied into 1694 cubic feet or volumes gives 20,328 cubic feet of steam, which amount represents the precise quantity of water which would occupy its place when such steam is reduced to the temperature of 40° F., and which we will suppose would rise 35 feet high which we are aware exceeds not only the average, but the maximum barometrical column. It therefore only remains to multiply the aforesaid 20,328 cubic feet into 62½ pounds, and that product by the assumed altitude the water is raised in a vacuum, viz., 35 feet when we shall have the maximum effect nature is capable of accomplishing, viz., 1,270,500 lbs. of water raised 35 feet high, or 44,467,500 lbs. one foot high, with one bushel of the best Newcastle coal.

Having shown the maximum effect that can be accomplished by the application of the atmospheric steam, generated by a given quantity of fuel, my next object will be to demonstrate that high pressure steam, when applied expansively, cannot produce so great an effect as atmospheric steam, thereby meaning to infer that no high pressure engine can perform the same amount of duty as a condensing engine, both consuming equal quantities of fuel. This is my deliberate opinion, founded on theoretical and practical experience, and which coincides with the opinion of almost every practical engineer whom I have consulted on this important subject. But what says the authority before refered to?—for in this as well as in the former question, just discussed, my arguments shall be drawn from the established laws of nature.

1st. That the sum of sensible and latent heat in steam is a constant quantity, viz., about 1172° F.

2ndly. That all matter, (steam, of course, included,) whether solid, liquid, or gaseous, from the most dense and refractory to the least ponderable, evolves caloric on compression, or increase of specific gravity, and absorbs caloric on dilatation, or when its specific gravity is diminished.

3rdly. To convert equal quantities of water of any assignable temperature, and under like pressure into steam of given temperature and elasticity, requires equal weights of fuel to be expended; but, although equal weights of water must absorb equal increments of caloric when atmospheric steam is generated, it does not follow that all the caloric absorbed in high pressure steam is exclusively supplied by the fuel expended. The law maintained is simply this, that the same causes produce the same effects.

4thly. That steam of two, three, or more atmospheres elasticity, is not composed of two three, or the like number of volumes of water contained in an equal volume of atmospheric steam, when generated under the same barometrical pressure, but contains proportionably less water as the pressure under which the steam is generated increases.

In proof of the foregoing theorems, I beg to adduce the following experiments and observations.

1st. If steam be blown through and condensed in a given weight of water of any previously determined temperature, until the said water arrives at, say, 212° F., the quantity or weight of water added by such condensation will be precisely the same, whether the steam employed be of atmospheric, double, treble, or more elasticity, thereby establishing the extraordinary fact, that all sensible caloric, exceeding 212° F., positively goes for nothing, it having become latent by dilatation. In this experiment, it is necessary to observe, that the steam condensed has lost no caloric by radiation till after such steam was converted into vapor, and the effect sought had been produced. How then a saving of fuel can arise by the use of high pressure steam worked expansively is to me an evident paradox, unless by some power utterly beyond my comprehension; the sensible caloric can