ARTICLE 15.—*Water Power of Quebec.* BY E. D. ASHE, *Lieut. Royal Navy, F.R.A.S., Director of the Observatory, and Vice President of the Literary and Historical Society, Quebec.*

[Read before the Society, Nov., 1854.]

I PROPOSE this evening bringing before your notice the Water Power of Quebec, in order that advantage may be taken of the great motive force that we have at our command.

Raising water for domestic purposes was one of the first things that occupied the inventive genius of man, and the fertilizing effects of a river overflowing its banks, no doubt soon taught him to irrigate the land, in a country where little or no rain fell during many months of the year; and it is remarkable that the most primitive mode, as well as the more advanced mechanical contrivance, is still in use on the banks of the Nile, in preparing the land for the seed.

The most simple contrivance consists of a shallow basket suspended from the centre of a rope, the extremities of which are held by two men: when water is required to be raised, the basket is dipped into the river, and the water thrown over a bank.

The water wheel worked by oxen, and generally known as the Persian wheel, consists of a number of earthen pots attached to a band that passes over the circumference of a large wheel, and sufficiently long to allow the vessels to reach the water, which they do mouth downwards; but in order to allow the air to escape there is a small hole in the bottom of each; now when the vessel leaves the water, it runs out through this hole in the bottom, but they are so arranged that the water falls into the vessel that follows it, so that after the first round each vessel receives as much water as it loses, consequently they all arrive full at the top, where they are emptied into a trough.

In hot climates, where a portion of each day was spent in the bath, man could not have been long in finding out that falling water produced the same force that would be required to raise an equal quantity of water to the same height from which it fell, and no doubt it was the first motive power in use for the various kinds of mills, and may lay an equal claim with the wind to having been the first contributor towards the civilization of man.

All that could have been done either in the way of raising water from its bed for ornamental purposes, or using it as a motive power, was done by the ancients.

Somebody has said that aqueducts are stupendous monuments of ancient ignorance, for had they known that water would rise to its own level, instead of spanning valleys with costly arches, they would have simply laid a pipe down one side of the hill and up the other—but I beg leave to say, that the only ignorance displayed (in my opinion) is by the person who made the remark; for the only pipes that the ancients could command for such a purpose were made of clay, and it was not until the more modern improvements in casting iron had taken place, that we were enabled to obtain a pipe of sufficient strength to bear the pressure of a column of water equal to the depth of the valley.

I think the foregoing remarks will prove that I have no intention of robbing old Cheops of what may probably belong to him, or of laying any claim to originality, I simply wish to shew, that an immense power is quietly waiting at our doors to be made use of.

Bringing water from Lorette merely to turn machinery, never would have paid, but since it has been brought into the Town for domestic purposes, a portion of it may very profitably be spared for mechanical purposes; in order to do this effectually, a reservoir must necessarily be constructed at the greatest available height near Town.

The Citadel is the place most elevated and best adapted for the purpose in the vicinity, and I have no doubt but that the Engineers would for such a purpose allow their large dry ditches to be turned into wet,—however, the land about No. 2 Tower is 330 feet above the level of St. Peter Street, and is sufficiently high for our purposes, where a reservoir of any dimensions might be built.

The endless variety of ways in which this power may be made use of, makes it difficult to choose one mode in preference to another. Perhaps the simplest and most efficacious way would be in working a piston in a cylinder similar to the steam engine, as I shall now point out.

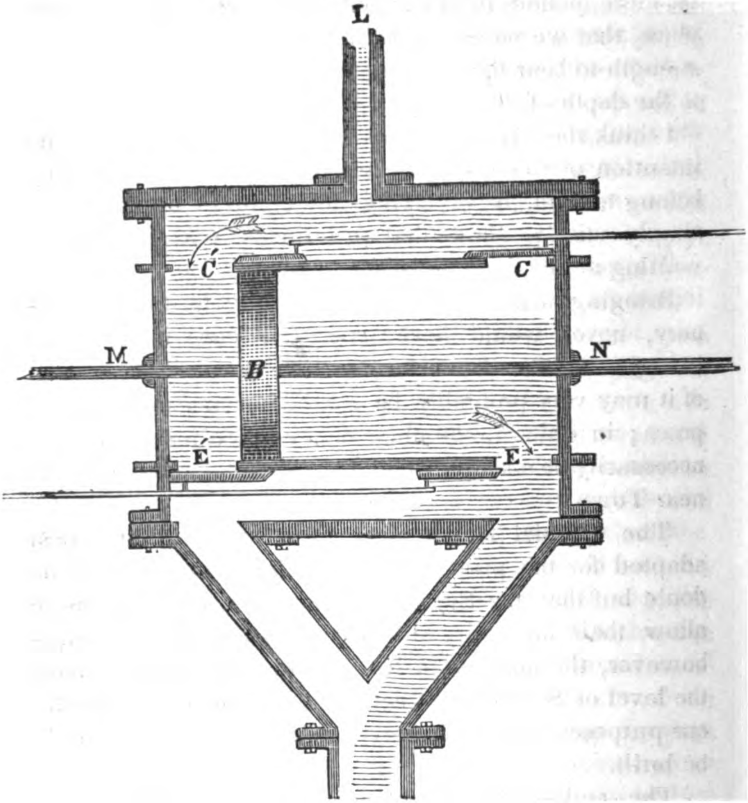


DIAGRAM No. 1.

Let the figure represent a cylinder placed horizontally, with a piston B, six inches in diameter, moving freely, but water tight.

The slides C' C and E' E are worked as in a steam engine, and need not be described here, it will only be requisite to say, that instead of steam, water is used.

The water enters at C' and flows out at E, as those ports are now open; whilst the piston B moves towards

N, those ports shut, and the opposite ports are opened, when the water enters at C, and runs out at E'; and thus a reciprocating motion is produced.

To calculate the power of this little engine, we have the weight of a column of water 300 feet, and one inch in diameter, equal to 102.2 lbs. which must be multiplied into the area of piston, which gives 25 cwt. 3 qrs. for the working force.

The number of strokes such an engine would make in a minute, will equal the number of times that the feed pipe L can fill the cylinder M N in a minute.

Using the formula $2h\sqrt{\frac{ag}{2}}$ for the quantity discharged in a second, where h = area of orifice, a = altitude of water, $\frac{1}{2}g = 16\frac{1}{12}$ feet, also taking $\frac{3}{4}$ of results for the practical application of the rule, and dividing by contents of the cylinder, it gives three revolutions in two seconds.

Here then we have an engine that may be put into a very small compass, and placed in the corner of a shop, without fear of fire or explosion, and of so simple a nature, that any one who could manage the cock of a beer barrel would be perfectly competent to take charge of it; the sole motive power being the flow of water through the water pipe L.

As there would be a metre attached to each, the mechanic would only pay for the water that passed through the engine.

I have now to call your attention to a Water Power on a much grander scale, and which, if taken advantage of, will, no doubt, make valuable returns to many of our citizens; not that I have any mercenary views; on the contrary, I shall be happy to give working drawings for any sort of engine that may be required either for saw mills, flour mills, discharging ships, &c., &c.

Fifteen feet may be taken as the mean rise and fall of the tide at Quebec, consequently the float of a tide guage moves through 60 feet in a lunar day, or about 26 inches an hour.

Many and various are the ways in which this unlimited power may be made subservient to the interests of our merchants; but time will only allow me to give the outline of a simple engine that may be worked by it. (*Vide* engraved Diagram, No. 2.)

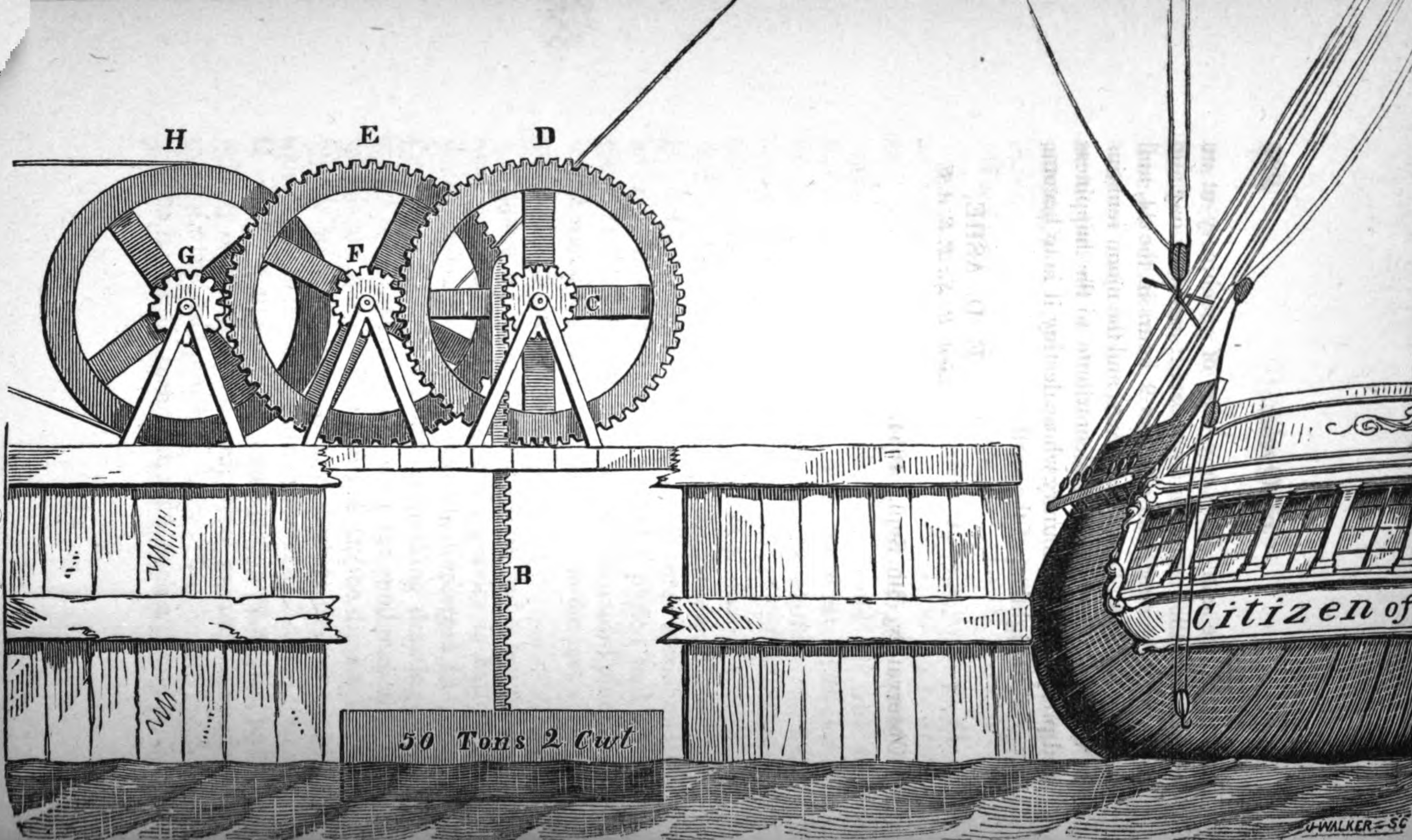
Let a platform 40 feet by 30 feet, or any size that may be convenient, and 3 feet in thickness, be made of fir, and kept in its place by guide rods, under any of the wharves. This platform would rise and fall with the flow and ebb tides, moving at the mean rate of 26 inches in an hour. To the surface of this platform is fixed a rack B, which also moves at the rate of 26 inches an hour; this rack turns the pinion of a small wheel C, 26 inches in circumference, and on the same axle is a wheel D, 26 feet in circumference, which turns round once in an hour, this wheel drives a similar pinion and wheel round 12 times in an hour, which drives a third pinion and wheel round 144 times in the hour; to the last wheel is attached a drum and belt.

Suppose a platform 40 feet by 30, and 3 feet in thickness, made of fir, whose specific gravity is half that of water, and consequently would be immersed 18 inches; then its maximum pressure, in pushing drawing-rod B, would equal 50.2 tons, and with the combination of the wheels and axles D E H and C F G, (the diameter of the wheels being 12 times greater than the diameter of the axles) the strap on the circumference of driving wheel H will have a force of traction equal to 82.22 lbs., and a velocity of 1.04 feet a second, which are only limited by ratio of wheel and pinion.

Thus it will be seen that, with such a power at our command, we can drive any sort of machinery at an expense of little more than first cost; it can work day and night with the exception of about 2 hours in the 24, and as long as the St. Lawrence flows, and the moon remains in her orbit, they will both contribute to the happiness and prosperity of a country whose destiny it is to become one of the mightiest of the earth.

E. D. ASHE,
Lieut. R. N., F. R. A. S.

Observatory, 8th Sept., 1854.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