

Results of the application of Horse-power to raising Water from the working shafts of Saltwood Tunnel, on the South-eastern Railway, in 1842. By FREDERICK WILLIAM SIMMS, Esq., M. Inst. Civil Eng.

This tunnel is driven in the middle bed of the lower green sand, between which and the surface of the ground is interposed only the upper bed of the same stratum; but in sinking the eleven shafts for the work, it was found that at the level of the top of the tunnel, the ground assumed the character of a quicksand, saturated with water, in such quantity that it could not be reduced by manual labor. Under these circumstances horse gins were erected for drawing the water by barrels, containing one hundred gallons each, weighing when full about 1310 lbs.

The engineer's intention was to drive simultaneously from these shafts, in the direction of the tunnel, an adit, or heading, to carry off the water; but the earth, which was sand mixed with fine particles of blue clay, was so filled with water as to become a mass of semi-fluid mud, great exertions were, therefore, necessary to overcome the water without erecting pumps. At first this was accomplished by making each horse work for 12 hours, and then for 8 hours per day, allowing one hour for food and rest; as the water increased it became necessary to work night and day, and the time of each horse's working was reduced generally to 6 hours, and sometimes to 3 hours. As all the horses were hired at the rate of seven shillings per day, the author, who had the direction of the works, ordered a daily register to be kept of the actual work done by each horse, for the double purpose of ascertaining whether they all performed their duty, and also hoping to collect a body of facts relative to horse-power which might be useful hereafter. This detailed register, which was kept by Mr. P. N. Brockedon, is appended to the communication.

The author gives as a proposition, "that the proper estimate of horse-power, would be that which measures the weight that a horse would draw up out of a well; the animal acting by a horizontal line of attraction turned into the vertical direction by a simple pulley, whose friction should be reduced as much as possible." He states that the manner in which the work was performed necessarily approached very nearly to these conditions; and after giving the principal dimensions of the horse gins, he analyzes each set of experiments, and, by taking the mean of those against which no objections could be urged, he arrives at the following results:

The power of a horse working for 8 hours = 23,412 lbs. $\left\{ \begin{array}{l} \text{raised 1 foot} \\ \text{high pr. min.} \end{array} \right.$

Do.	do.	6 "	= 24,360 "	do.
Do.	do.	4½ "	= 27,056 "	do.
Do.	do.	3 "	= 32,943 "	do.

Of these results he thinks the experiments for 6 hours, and for 3 hours, alone, should be adopted as practical guides, all the others being in some degree objectionable.

As a means of comparison, the following table of estimates of horse-power is given:—

Name.	Pounds raised 1 foot high in a minute.	Hours of work.	Authority.
Boulton and Watt,	33,000	8	{ Robison's Mech. Phil., vol. ii. p. 145. Tredgold on Railroads, p. 69.
Tredgold,	27,500	8	
Desagulier,	44,000	8	{ Dr. Gregory's Mathematics for Practical Men. p. 183.
Ditto,	27,500	Not stated.	
Sauveur,	34,020	8	
Moore, for Society of Arts,	21,120	Not stated.	
Smeaton,	22,000	Not stated.	

These are much higher results than the average of his experiments, and would more nearly accord with the extremes obtained by him; but under such excessive fatigue the horses were speedily exhausted, and died rapidly. Nearly one hundred horses were employed, they were of good quality, their average height was 15 hands $\frac{1}{4}$ inch, and their weight about $10\frac{1}{2}$ cwt., and they cost from 20*l.* to 40*l.* each. They had as much corn as they could eat, and were well attended to.

The total quantity of work done by the horses, and its costs, was as under:

Registered quantity of water drawn 104 ft., the average height, 28,220,800 gallons,	=	Tons. 128,505
Registered quantity of earth 3,500 yards, 1 ton 6 cwt. per yard,	=	4,550
Total weight drawn to the surface		133,055
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Total cost of horse labor, including a boy to drive each horse,		£ s. d. 1,585 15 3
Or, 2.85 pence per ton, the average height of 104 feet.		Lond. Mech. Mag.

Franklin Institute.

SUPPLEMENTARY REPORT

Of the Committee on the Thirteenth Exhibition of American Manufactures, held in Philadelphia from the 17th to the 28th of October, 1843, by the Franklin Institute of the State of Pennsylvania, for the Promotion of the Mechanic Arts.

The following awards are made made in conformity with the revised reports of the judges, on the several articles named:

II.—Woolen Goods.

Nos. 145 to 147, embossed table covers, by Duncan & Cunningham,