The line of gravity was not always the line of pressure. In a steep seam all the timber should be set at right angles to the plane of stratification. The props should always be set so that the pressure upon them should be distributed evenly over the surface, that every fibre should receive its fair share of the load. Mr. Halbaum also briefly touched upon the advisability of having lids on the props, but spoke against nails being hammered into them. In conclusion, he again referred to the great importance of the subject, which he hoped would in the future receive more consideration from their mining institutions. They had recently in one course had three papers only on timbering and fifteen on fire-damp and coal-dust, but he hoped that before long the subject of timbering would receive the attention that it deserved.

The above report is taken from the *Mining Journal.*

HYDRAULICS.

The following instructive papers on hydraulics, written by Mr. Alexander Aitken, manager of the Government water-races at Kumara, who has carried out experiments for the purpose of verifying the calculations therein set forth, will be found of considerable service to those interested in hydraulic sluicing and elevating:—

Power of Water.

The following short method of calculating the practical horse-power of water that can be realised by various water-motors is based on the fact that one sluice-head of water falling 8·8 ft. is equal to 1 theoretical horse-power. A sluice-head of water is 1 cubic foot of water per second, or 60 cubic feet per minute. A cubic foot of water weighs 62½ lb., therefore a sluice-head of water delivers 3,750 lb. of water per minute. This multiplied by 8·8 ft. gives 33,000 foot-pounds, or 1 theoretical horse-power:—

$$60 \times 62{\cdot}5 \times 8{\cdot}8 = 33{,}000 \text{ foot-pounds} = 1 \text{ horse-power.}$$

Table No. 1 shows the approximate percentage of the theoretical horse-power of water actually realised by various water-motors. Table No. 2 gives the hydraulic head necessary to obtain 1 effective horse-power from one sluice-head of water with motors that can practically realise from 30 to 100 per cent. of the theoretical power of the water, but no motor has yet been constructed that will realise much more than 90 per cent. of the theoretical power of water.

The hydraulic (or hydro-dynamic) head of water is the total vertical height of the supply above the point of discharge, after due allowance has been deducted for friction and other retarding forces in the pipes (or other conduit) delivering the water to the motor. Total head, *minus* allowance for friction, &c., equals hydraulic head.

If pipes are large enough to convey the required quantity of water to the motor at a velocity not greater than 1 ft. per second, and the length of the pipe-line is not great, allowance for friction, &c., is not necessary, and the total head may be taken as the hydraulic head. If, however, the pipes are small for carrying the required quantity of water, and the velocity of the water is from 3 ft. to 20 ft. per second, the allowance for friction, &c., cannot be disregarded, as it may in some instances where the pipe-line is long absorb the whole of the total head, and only deliver the water without being capable of developing any power.

Pipes conveying water for power cannot be too large, the only limit being the practicability and the cost. For determining loss of head by friction, &c., consult instructions and table prepared for that purpose.

Table No. 1.—Percentage of Theoretical Horse-power realised by Various Water-motors.

	Per cent.
Undershot wheels	30 to 35
Low-breast wheels	50 „ 55
High-breast wheels	55 „ 60
Overshot wheels	60 „ 65
Turbine wheels	60 „ 70
Pelton wheels	80 „ 90
Water-pressure engines	70 „ 80

In the above table the percentage of theoretical horse-power developed by the various water-motors has been ascertained from actual experiments, and it varies within the limits given, according to the manner in which the construction and fixing is carried out.

To obtain the highest efficiency the motors must be suited to the quantity of water used and properly constructed. The manner in which the water is supplied and the regulation to the proper speed are matters of the utmost importance in obtaining good results. The correct speed for the periphery of a Pelton wheel is one-half the speed of the water issuing from the nozzle. The high efficiency of the Pelton wheel is due to the very perfect manner in which it reverses the direction of a jet of water, discharging the water almost without motion.