A NEW WATER PUMP: SPIRAL TUBE

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THE great Roman waterwheels of Hama in Syria have raised water for Man for over a thousand years. They serve as superb examples of a technology so elegantly simple that it becomes totally dependable. These great wheels and many thousands like them raise water on the rim to spill into troughs just below the full height of the wheel. The diameter of the wheel must therefore be equal to or more than the desired pumping head, and for this reason many have been built to huge proportions. Attempts to use the power of the wheel to raise water above the level of the rim have often involved the use of chains, valves, pistons and levers, all of which totally destroy not only the simple elegance of the wheel but also its dependability.

SPIRAL TUBE PUMP

This article reports the successful operation of a water-wheel operated pump which raises water well above the level of the wheel rim. The pump is a perfect match for the wheel for it is simple and dependable and consists of little more than a tube open at both ends. Surprisingly, searches through the relevant literature have so far failed to reveal a similar arrangement.

The tube is so arranged that it forms a spiral fixed on the side of the wheel in one plane (Fig. 1). The outer extremity of the tube collects water as it dips into the water driving the paddles of the wheel, and this core of water passes through the spiral followed by a core of air. A new core of water is formed on every revolution. The innermost spiral of the tube delivers water to the axle of the wheel and there it is led off through a simple water seal to a static rising water pipe.

As the wheel revolves a pressure head develops within each coil of the spiral tube, water in the rising coils being higher than in the falling coils. The cores of water in the spiral compress the air between them as they travel round the tube and both water and air are expelled under pressure at the central point. The height to which water can be pumped appears to depend on the number of spirals in the tube. A 2m diameter wheel can pump water up to at least 8m with 6 complete coils, the same wheel being able to pump up to 6m with 4 complete coils and 4m with 2 complete coils. The volume pumped depends on the amount of water picked up during each revolution and on the capacity of the spiral tube. Several spiral tubes can be fitted to the same wheel. The flow of water up the static rising pipe is also accelerated by the air escaping and expanding from the outlet at the axle of the wheel. With a single spiral, air and water are expelled alternately at the outlet, the pressure heads in each coil developing to their maximum as the water pressure head in the rising main is at its highest. With two spirals, air and water rise through the pipe in more regular bursts.

Considerable pumping heads could be achieved if necessary by using an appropriate number of coils on a wheel of appropriate size in a canal or river system charged with adequate water power. The power delivered to the paddles must overcome the weight of water held in the rising segments of the spiral, and obviously this is a limiting factor. When the number of coils in the spiral is not sufficient to pump to the desired head, water flows over from one coil to the next, in the spiral and there is a loss of efficiency.

The great advantage of the system is its extreme simplicity and reliability. The pump makes a perfect partner for the wheel and both harmonise with the natural system. Hopefully, arrangements like this spiral-tube pump could revive the status of the waterwheel in a world sadly lacking in cheap energy.

PRESENT USE

The small 2m wheel illustrated on the front cover of this issue is on trial at Henderson Research Station. It delivers 7000 litres of water a day from a small canal supplying fish ponds and raises it to a height of 4m. The same wheel is capable of pumping water to over 8m if necessary. ZR$1.00 worth of petrol would be needed every day to pump the same quantity of water to the same head tank. This indicates the very considerable saving of money and fuel even on this very small scale.

The development of this pump forms part of a programme of “Appropriate Technology for Health” being carried out by the Blair Research Laboratory in Salisbury. Thanks are due to the Secretary for Health for permission to publish this article.
Fig. 1—Front and side elevations of Spiral Tube Pump.

Water pumped up by the Spiral Pump.