

we got together the following data: Wells about 400 feet deep. Water standing to within about six feet of the top when not being pumped. When being pumped, the water fell to about eighty-four feet. Wells were cased with 6 $\frac{3}{4}$  inch I.P. casing. Air pipe one and a half inches. During the twenty-four hours there were delivered 2,016,678 gallons water, lifting it about ninety-six feet. There was an average delivery of 11.15 gallons of water per horse power.

Cards were taken from the steam and air end of the compressor each hour. Average horse power of steam cylinders, 125.6. Average horse power of air cylinders, 116.14, showing a mechanical efficiency of about ninety-two per cent. or about eight per cent. of friction.

We also have the following data taken from one month's report in pumping water from three deep wells:

Steam pressure, 80 pounds.

Air pressure, 68 pounds.

Tons of coal of 2,000 pounds per month, 106 $\frac{1}{2}$ .

Cost of coal per month, \$167.60.

Cost of coal per ton, \$1.57.

Amount of free air per minute, 352.8 cubic feet.

Amount of free air per day of 24 hours, 508,032 cubic feet.

Amount of free air per month, 15,748,992 cubic feet.

Revolutions per minute, 45.

Pounds of coal per 1,000 feet of free air, 13.5.

Cost per 1,000 feet of free air, .0106 cents.

Amount of water pumped, 76,255,000 gallons.

Cost per 1,000 gallons, .002 cents.

Compressor in use with the above is of duplex design, having duplex air cylinders 14 inches in diameter by 22 inch stroke and duplex air cylinders 14 inches in diameter by 22 inch stroke. The steam cylinders are fitted with Meyer adjustable steam valves and the air cylinders are fitted with mechanical air valves, air taken from outside the engine room. The above cost is for the air delivered from the compressor for fuel only, that is, the cost of oil, labor and other interest for the plant not considered. Horse power, 51.

I also take the opportunity of bringing before you something that will be more particularly of interest to the railroad man who is connected with the water pumping department. It is often necessary for a railroad, or a municipality, or a factory to establish a pumping station for the supply of water some distance from where it is convenient to get fuel, yet where the water is delivered it is very convenient to secure fuel. The question which has been taken up is to do away with the two separate steam plants, the extra help, the general upkeep and, in many cases, the handling of coal. The question came up as to what the best method would be to overcome the above objections by an air or pneumatic pumping system