INDUSTRIAL.

The Dodge Wood Split Pulley Company call attention to their advertisement in another place. Their system of rope transmission of power is one that has found much favor at a number of our mines and collieries, and well deserves the attention of such of our engineers as may be figuring on new power plants.

A most severe and very interesting test was made last week by Wm. Sellers & Co., of Philadelphia, upon a motor operated under the new principle invented by Mr. H. Ward Leonard. The motor used was a 10 H.P. standard shunt-wound Sprague motor. The motor's normal speed was 1,500 revolutions a minute. The motor was belted to a countershaft, and upon the countershaft was placed a brake, and in addition to the brake there was placed upon the countershaft a large fly-wheel such as is used upon punching machines, the purpose of the fly-wheel being to duplicate the inertia and momentum met with in practice in a great many kinds of work.

The motor was made to operate in either direction at any rate of speed desired, and it was found possible to run the motor perfectly and regularly under the full brake load at 15 revolutions per minute, that is, one per cent. of its full speed. While operating at full speed in one direction, the motor could be instantly reversed, the reversal being perfectly gradual and entirely without any spark or troublesome feature of any kind.

In order to get the most marked effect in overcoming the momentum of the fly-wheel the brake was taken off, and when the fly-wheel was running at its full speed of 300 revolutions a minute, the motor was reversed instantly. In thirteen seconds the motor had brought the fly-wheel to rest, and in thirteen seconds more had it running at full speed in the opposite direction, the entire operation being effected with the greatest smoothness and without any spark whatever.

The performance of the motor was extremely satisfactory to all concerned, and showed its perfect adaptability to any class of work to be met with in practice.

The Ingersoll Rock Drill Company of Canada has just closed a contract to put in several of their Sergeant coal cutters and other mining machinery in Cape Breton collieries. Mr. George R. Smith, who has just returned from the Pacific coast, reports that the company has also done well there, having made some good contracts with the collieries and mines.

The Jeffrey Manufacturing Company, Columbus, Ohio, reports business as good in their different lines of specialties. They have many large orders on their books for elevators and conveyors for handling material in bulk or package, and have recently purchased a tract of land adjoining their present extensive works, on which they have erected a large substantial brick building, that they may be better able to take care of their growing business.

Quarrying and Splitting Slate.

In quarrying slate, the methods vary greatly according to the disposition of the beds, and no attempt will be made here at a detailed description. Ordinary blasting powder is employed in loosening the blocks, and great skill and sagacity is shown by experienced quarrymen in so manipulating the blasts as to produce the desired effects of freeing the rock from the quarry bed without shattering the stone. After a block is removed from the quarry it is subject to special treatment, according to the purpose to which the stone is to be put. If for roofing slate, the block is taken from the quarry to the splitters' shanty, where it is taken in charge by a splitter and his two assistants. The first assistant takes the block and reduces it to pieces about 2 inches in thickness, and of a length and breadth a little greater than those of the slates to be made. This is done by a process called "sculping," which is as follows: A notch is cut in one end of the block with the sculping chisel, and the edge of this notch is trimmed out with a gouge to a smooth groove extending across the end of the block and perpendicular to the upper and lower surfaces; the sculping chisel is then set into this groove and driven with a mallet until a cleft starts, which by careful manipulation is guided directly across the block. The upper surface of the block is kept wet with water so that the crack may be more readily seen. If the slate is perfectly uniform in shape and texture, and the blows upon the sculping chisel are directed straight with the grain, the crack follows the grain in a straight line across the block. Almost invariably, however, the crack deviates to the right or left, when it must be brought back by directing the blow on the sculp in the direction in which it is desired to turn the break or by striking with a heavy mallet on that side of the block toward which it is desired the crack shall turn. Some slates can be sculped across the grain, but nearly all must be broken in this direction. From the first assistant or "sculper," the block goes to the splitter, who, by means of a mallet and broad thin chisel, splits it through the middle, continuing to thus divide each piece into halves until the desired thinness is obtained. It is necessary to keep the edges of the blocks moist from the time they are removed from the quarry until they are split. From the splitter, the thin but irregular shaped pieces pass to the second assistant, who trims them into definite sizes and rectangular shapes. This is done either by hand or by machine. To trim by hand a straight-edged strip of iron or steel is fastened horizontally upon one of the upper edges of a rectangular block of wood, some 2 to 4 feet in length. The trimmer then lays the sheet of slate upon the block, allowing the edge to be trimmed to project over this strip, and then by means of a long heavy knife with a bent handle, cuts off the overlying edge, thus reducing it to the required size and shape. Two kinds of machines for doing this work are now in use. In general they may be said to consist of an iron frame work some 2½ feet high, with a horizontal knife edge upon its upper edge. Against this knife is made to work, by means of a treadle, another knife, curved in outline, which is thrown upward again by means of a spring, after being brought down by the treadle-movement. At right angles to this knife edge, on one side of the machine, an iron arm projects toward the workman; this arm has notches cut into it for the different sizes of the slate. The difference between the two kinds of machines is said to consist chiefly in the arrangement of the cutting knife, one working as stated above, while the other revolves on an axle something in the manner of an ordinary corn cutter. Slates are sawn by means of an ordinary circular saw, such as is used in sawing lumber, and are planed by machines such as are used in planing metals, as are other soft stone. Some of the hard slates used for tiling have to be cut by means of circular saws with teeth of black diamond. In trimming out school slates at the Pennsylvania quarries, there is used a square saw of chilled iron, someteen or twelve inches in diameter, and with one long projecting tooth at each of its four corners. This revolves with great rapidity and clips off the thin edges as quickly and neatly as could be desired.

The Pressure of Gas in Coal.

Coal in bituminous mine seams is more or less subjected to bleeding. This is known to the practical miner; he is constantly observing the sweating of the coal, accompanied with a hissing sound. The sweating is produced by the pressure of gas stored up in minute cavities and fissures of the seams. The pressure has been found in some cases to be nearly equal to the pressure of steam in the boilers of steamships. Pressures of 200 pounds and upward have been found to be common in deep seams newly opened. What is interesting about the matter is the co-relationship of the pressure of gas to the pressure due to a vertical column of water, measured from the seam to the drainage level of the rocks overlying the seam. To make this clear, let us suppose a seam to be 250 fathoms from the surface; again, let us suppose the drainage level is about 50 fathoms from the surface. Now by these data we may, with considerable accuracy, calculate the pressure of gas stored up in the cavities of the seam. Suppose the seam has not been wrought, but has been pierced by a bore hole. If a long iron tube was inserted in this bore hole and made to fit the hole so closely by some system of packing that no gas could escape, and a pressure gauge was screwed on the upper end of this pipe and allowed time for gas to accumulate in the bore hole, the pressure ultimately observed might be calculated as follows: Vertical height of water being 200 fathoms, then—

$$\frac{200 \times 6 \times 62{\cdot}5}{144} = 520 \text{ pounds pressure on the square inch.}$$

This calculation may be made by a simpler process: a square inch column of water having a vertical length or rise of 6 feet weighs nearly 2·6 pounds, therefore $200 \times 2{\cdot}6 = 520$, or is equal to a pressure of 520 pounds on the square inch, as before. Often, at faults and dislocations, water and gas are met with in unusual quantities. Sometimes on cutting a fault, gas is given off, generally at the bottom of the seam, and this often consists of sulphureted hydrogen. Water generally comes off at the fault at the top of the seam, and after it has expended itself, it is followed by gas. Now, why gas should be found at the bottom of the seam and water at the top, is a matter full of interest. Water is sometimes given off at the bottom of the seam, and when that is the case, the reason why requires observation and investigation. Some cavity in the neighborhood of the fault contains gas at a high pressure, but is situated above another cavity filled with water, so that while the gas is pressing on the water, water flows from the bottom of the seam, through some vent or parting in the fault, but as water is heavier than gas, if the water and gas are found in one cavity, if the bottom stratum of rock communicating with the fault or fissure, then gas only is given off, and sometimes at a high pressure. But it will be noticed that after a while the gas is all spent off, and the air in the neighborhood of the fault resumes its normal condition. The gas is expelled by the operation of Boyle's law; it exists in this bottom cavity at a pressure considerably above that of the atmosphere and if the pressure of the gas in the cavity was three times that of the atmosphere, on that pressure being removed it would expand into three times its original volume, or every cubic foot in the cavity would expand into three cubic feet, two of which would be expelled. When water is given off at a fault at the top of the seam, we may certainly expect it to be followed by gas, because, being lighter than water, it is pent up at a high pressure above it, and the high pressure of the gas causes a rapid or violent outflow of water. Now as gas cannot sink in water, if the bottom of the cavity communicates with the fault, then no gas will spend off until the water has all been expelled.

A Rope Four Miles Long.—A single rope, 4 miles long, and weighing 20 tons, has been turned out at the ropery of Messrs. Webster and Sons, Deptford, Sunderland. It is made of the best steel wire, and is intended for a colliery in the south-west of England, where it will be used for underground haulage. As the cranes at the rope yard and at the goods station are not strong enough to lift such a load all at once, the rope was made up into three coils, and, allowing the slack connecting these to hang, they could be lifted one at a time. Two were put on one rolley, a very strong one, and the third coil, which contained much less rope than the other two, was put on to an ordinary rolley. Several men carried the slack which hung from one vehicle to the other over their shoulders. The load was drawn by 20 horses, and the passage through the streets attracted much attention.

The World's Horse Power.—It is stated in *Handel's Museum* that the steam power of the world is equal to the strength of 1,000 millions of men, or twice the number of working men that exists. The horse power of England as regards engines, is estimated at 7,000,000, of the United States 7,500,000, Germany, 4,500,000, France 3,000,000, and Austria 1,500,000. These figures do not include the horse power of locomotive engines, of which it is estimated that last year there were in the whole of the world 105,000, representing horse power from 5,500,000 to 7,000,000. From further calculation it is considered that the total horse power of the world's engines is about 49,000,000, the average strength of each engine being equal to three horses, the power of the horse being equivalent to the strength of seven men. The steam engine, there is no question, has been of the greatest possible advantage to the working classes all over the world, for it has lessened their labor by doing the heaviest portion of the work, and so saving their strength. Yet machinery for economising human labor even now is strongly opposed by those who would be most benefited by it.

A Heavy Coal Train.—It is reported that last Sunday locomotive 955 on the Philadelphia and Reading Railway hauled a train of ninety 25 ton cars loaded with coal, from Palo Alto to Port Richmond. These cars were all about 34 feet in length, thus making the total length of the train about 3,100 feet, or considerably more than half a mile. The total weight of the train was estimated at 2,375 tons. The weight of the engine was about 75 tons. If this report is true the train hauled was probably the longest and heaviest that was ever taken over that road.

A Novel System of Coal Hoisting.—The Southwest Coal and Coke Company will introduce a novel system of coal hoisting when it gets the new air shaft at its Tarr's plant completed, as that work will be done by water. The big fan and part of the machinery are already in place awaiting the erection of the house and the sinking of the shaft which, at this point, will reach the coal at a depth of some twenty-five feet, although it is the basin for a goodly portion of the company's 2,500 acre coal field, and from it the drainage will be pumped. One of the cages will not differ from those in general use, while the other will have built on it a tank. When a waggon of coal for the boilers has been placed on the cage at the bottom, water from a pump discharge pipe will be turned into the tank until it is heavy enough to sink to the bottom, drawing the cage up as it descends. An automatic valve will then let the water run out, when the tank, being lighter than the cage and empty waggon, is in turn drawn to the mouth by them.—*Connellsville Courier.*