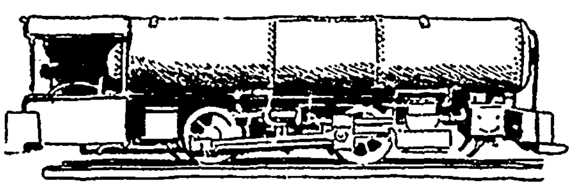
apart from those of the general community. With the cultivation of such a spirit, it becomes easy to see how, not only intermunicipal and interstate interests may be provided, but also how the questions of international importance will be found of easy and simple solution.

TRIAL OF A COMPRESSED AIR LOCOMOTIVE AT NEW ORLEANS.

At New Orleans last month there was successfully tested a locomotive of a type different to any previously constructed. Although compressed air locomotives have been in use in mines for some time past, this one is stated to be an improvement on all others. Many advantages are claimed for this engine for mines, tunnels or underground work, as it distributes fresh air and is free from smoke, fire, and deleterious vapors. There are three of these engines in use, one at the Susquehanna Coal Company, Pittsburg, and two at New Orleans on the Western Railway, hauling cotton and other inflammable freight. They result in a great reduction in cost and danger from fire in handling freight, when sparks from locomotives would be dangerous. They have also many advantages for use in tunnels, etc. Their shape presents no obstruction that would hinder their entrance into a small level shaft. The engine being self-contained and having no tender, can be run around sharp curves and steep grades; further, the working parts are few in number, with no wear and tear of boilers, so that they are simple, easy of operation and durable. Their low cost is also an advantage. The dimensions of the locomotives, a sketch of which is here



shown, are as follows: 17 feet 6 inches long, 5 feet 2 inches wide over all, and 5 feet high. Its weight is 1,900 lbs., the cylinders are 14 by 18 inches, the pressure of compressed air in the tanks is 600 lbs. to the square inch, after being charged at the charging tank. The charging can be done in a very short time. The capacity of the tank at this pressure is 140 cubic feet. The air is delivered to the cylinders at 120 lbs. to the inch and expanded four or five times on the pistons. The tank heads are convex outwards, the circumferential seams are double riveted and the horizontal ones treble riveted. There is a man-hole in the front head which is of very strong construction to be safe under the great pressure. It is, however, not considered that an explosion would be dangerous should one take place, as the condition would be entirely different to that of a steam boiler with a large body of highly-heated water and steam. A powerful brake is provided, braking each of the four driving-wheels. The axles, crank pins, rods, cross-heads and guide-bars are all steel and hardened; removable bushes and pins are provided throughout for the valve gear. Sand boxes are also on the engines as on locomotives. All operating levers and valves, link motion, etc., are immediately at the hands of the engineer. The work on these engines throughout is of the best locomotive class designed for the best efficiency under severe conditions. They are found in practice to do all that was promised or expected of them. A charging air-compressing engine pumping into a tank furnishes the compressed air. It is always ready when required.

COMBUSTION.*

BY THOMAS WENSLEY, OTTAWA.

(Concluded from last issue.)

I will here give you an approximate list of square feet of heating surface per horse-power in different styles of boilers and various other data for comparison:

Type of Boiler.	Square feet of heating surface for one horse-power	Coal per sq. foot lbs. per hour.	Relative economy.	Relative rapidity of steaming.	Authority.
Water tube....	10 to 12	.3	1.00	1.00	Isherwood.
Tubular	14 to 18	.25	.91	.50	"
Flue..........	8 to 12	.4	.79	25	Prof. Trowbridge.
Plain cylinder..	6 to 10	.5	.69	.20	
Locomotive ..	12 to 16	.275	.85	.55	
Vertical tubular	15 to 20	.25	.80	.60	

A horse-power in a steam engine or other prime mover is 550 foot lbs raised one foot per second, or 33,000 lbs. one foot per minute.

In *Engineering* of August 17th, 1894, there is a report of two tests made with a triple expansion mill engine of 1,000 horse-power, built by Victor Coates & Co., limited, of Belfast, for the spinning mills of the Brookfield Linen Company, limited, of the same city. This engine was set to work on the 18th of September, 1893, and has been at work ever since, giving satisfactory results, especially in the matter of fuel consumption and steady driving. As shown by these tests, the amount of water used is remarkably small, being 11.5 lbs. per hourly horse-power, and the coal consumption was 1 lb. The diameters of the cylinders are respectively 19, 29 and 46 inches, with a stroke of 48 inches. The steam was generated in two Lancashire boilers, 7 feet 6 inches in diameter and 30 feet long; each boiler has two furnaces of the Adamson type, having five Galloway tubes in each, and the total heating surface of the two boilers is 1,900 square feet. On these tests the engines were not running at full power, but were developing 787.4 horse-power, so that the heating surface per horse-power in this case was 2.41 square feet. The feed water was heated in the economiser to 250° Fahrenheit, and if we include the heating surface of the economiser, 3,600 square feet, there would be a total of 5,500, or 7.112 square feet per horse-power. The economiser is placed in the base of the chimney, and the feed water is heated by the hot gases which are passing away to the atmosphere, and would otherwise be a total loss.

When anthracite or hard coal is used, there should be from 22 to 24 inches between the top of the bars and the lowest part of the boiler. If bituminous or soft coal is the fuel used, then from 27 to 30 inches.

It is an absolute condition of economy and efficiency that the grate bars shall at all times be well and evenly covered with the fuel, but this condition is one that is frequently neglected. If the bars are not uniformly and evenly covered, the air enters irregularly in streams, passing through the thinnest or uncovered parts; if too thickly covered it prevents the air entering. You all know that the thickness of the fire will depend upon the size of the coal used. The smaller the fuel the thinner the fire. With egg coal from 6 to 8 inches, and with furnace coal from 8 to 10 inches, have been found the best results in practice. In burning soft coal the charges should be light, as, the gases which are evolved will have a better opportunity of getting the requisite quantity of oxygen.

* A paper read before the Canadian Association of Stationary Engineers.