Stanley's and the work Mason's. It is in most respects similar to Whitney's, but does not have the cylinder within the steam space of the boiler as has the latter. The Mason frame consists of a girder of steel tubing at each end, supporting the axles and connected underneath by two lattice braces, each formed of two crossed rods secured at their ends to the front and rear girders, and fastened together at the crossing. The upper corners of the two girders are joined by two composite side-bars, the wagon body being secured to these side bars by clips. The general scheme of the motive part of the Mason wagon is to locate the vertical boiler under the seat, and to pivot to the front side of the boiler a frame carrying a pair of piston valve, link motion, simple, steam engines, cylinders 2-inch bore by 3-inch stroke, working downward on cranks at 90 degrees. Mason uses a 12 pound flywheel on his engine shaft, with a view to equalization of torque when cutting off very early. Besides the flywheel the crank shaft carries an 8-tooth sprocket, from whence a Baldwin separable cycle chain leads to a 32-tooth sprocket on the compensating gear case on the rear axle. The rear axle is not divided, a sleeve being used to transmit power to one of the rear wheels. To secure a ready chain adjustment, a right and left threaded strut is pivoted to the compensating gear yoke, which forms a part of the rear axle support, and reaches forward to the engine frame. As the engine and boiler are carried on the wagon body springs, this screw strut requires a universal jointing to accommodate the variations in the relative positions of the engine crank shaft and the rear axle. The engine frame is pivoted on a steam admission located a short distance to the rear of the mid-point of the piston travel, hence the entire fabric of the engine frame and the engine has a free pendulum movement on the tri-union, enabling the driving chain to be very easily adjusted to a nicety The firing of the Mason boiler is controlled by the use of a regulator acting on a diaphragm actuating the fuel admission valve. The gasoline is carried in a copper tank under 20 or 25 lbs. air pressure, maintained with a hand operated air pump This air pressure drives the fluid gasoline into a horizontal vaporizing tube, reaching entirely across the fire-box, close to the top of the burner. There is no valve between the gasoline tank and the vaporizing tube, and the fuel supply regulating valve is placed between the vaporizer and the burner, and acts on the gasoline vapor, not on the fluid before vaporizing. When the pre-determined boiler pressure is reached the regulator closes the fuel admission valve completely; to avoid the total extinguishment of the fire, a very small by-pass opening is provided around the fuel valve, this by-pass admitting vapor enough to the burner to keep the burner lighted and to keep the vaporizing tube hot, so that as soon as the boiler pressure falls the fire will be automatically increased without any attention on the part of the driver. When the regulator reduces the fuel supply it also opens a large area of cold air supply to the fire-box of the boiler, and thus instantly checks the generation of steam, so that the safety valve never opens to discharge any steam into the open air, which is of very great importance, as this avoids an emission of visible steam, and also avoids a waste of boiler feed water, both very desirable points. The gasoline is carried in a cylindrical tank, located well forward, under the foot-board. The water tank is in the rear of the boiler. The boiler is clothed first with sheet asbestos, ¼-inch thick, then with hair felt ⅝ or ¾ inches thick. The tanks are of sheet copper. The smoke bonnet leads horizontally to the rear, and has an upwardly directed rectangular opening or smokestack, not more than an inch high, projecting a very little above the rear body cover. This smoke discharge is supposed to be of use when the wagon is standing still and the fire is burning. The smoke-stack is also carried downward and to the right side, and terminates in a downwardly opening, cylindrical nickel-plated smoke-stack, extending about 10 or 12 inches below the bottom of the wagon body. There is no damper in this smoke duct. The exhaust pipe is carried across the top of the boiler inside the smoke bonnet, and terminates in a nozzle directed downward into the cylindrical smoke-stack mentioned; and when the engines are running there is a very perceptible down-draught through the rectangular uptake at the rear of the smoke-bonnet.

The Legislation Committee of the Trades and Labor Council, Toronto, waited on Hon. John Dryden recently, to ask that certain clauses in the Ontario Factories Act be rigorously enforced They want a blower attached to all dry emery wheels.

EXCESSIVE HEATING IN A CORLISS ENGINE.

Editor CANADIAN ENGINEER :

What is the correct lead to give valves of a cross compound Corliss engine, driving air compressors direct connected to the piston rods ? What would be the pressure on crank pins when thus connected, and would this pressure on crank pins be sufficient to cause excessive heating ?

Toronto, October 15th, 1899. ENGINEER.

THE DIESEL HEAT MOTOR.*

The Diesel motor has attracted more or less attention for the last two years, but the principles upon which it operates, and which are so widely different from other motors, have not been generally understood. Hirn's work at Mulhouse, Professor Lanza's work in Boston, and Isherwood's practical experiments, roused mechanical engineers to the importance of considering the utilization and conservation of heat in the steam engine as the fundamental question of design. Even Ericsson, one of the pioneers of the steam engine, had previously turned to the hot-air engine to escape from those losses inseparable from the employment of steam. Naturally enough, then, many scientists and inventors turned again to the internal combustion engine, which had been previously experimentally developed by Barnett in England, Drake in America, LeNoir in France, improved by Brayton, Barsanti, and others, ably discussed and advocated by Dr. Siemens, and finally developed into a practical working machine by Otto in 1876. Otto's master patent, though at first vehemently attacked, became the foundation on which Priestman, Crossley, Atkinson, Capitaine, Clerk, and others, built up a number of types with a gradual and satisfactory increase in economy. But they all worked in the beaten path of mixing a charge of gas and air, carefully compressing it, and igniting it for explosive action by various igniting devices. Not one attempted a vital change in the cycle itself until Rudolph Diesel, in 1893, proclaimed his method and attempted the development of a practical working engine on the ideal of Carnot.

After experimenting with various vapors more permanent than steam, and at first attempting both to add and withdraw the heat from the working fluid from without, he reached the conclusion that the atmosphere about us would furnish a cheap, endless supply of permanent gas, available not only as the vehicle of heat, but as the means of evolving it from the fuel employed.

Rudolph Diesel is a Bavarian, 40 years old. He received his early education in Paris, where his parents then resided, until they were forced to emigrate in 1870 by the decree of the empire. He is a man of studious habits, a good mathematician and thoroughly versed in the science of thermo-dynamics, which he has made his life study. As a student at Munich he was a pupil of the celebrated Professor Linde, now well known as the inventor and builder of the ice machine which bears his name. Since the publication of his lecture of June 16, 1897, he has been fairly overwhelmed with praise and congratulations by the leading professionals of Europe. For the past fifteen years Mr. Diesel has devoted himself almost entirely to this work. He even built a small experimental motor in Paris many years ago, the working of which enabled him to modify his first theories considerably. He, however, took the precaution to have the parts of this motor made in different shops to prevent his ideas and processes from becoming known. In 1892 he made his applications for his first patents in different countries. On the 16th of June, 1897, he delivered a lecture before the National Society of German Engineers at Cassel, in which he not only developed his theories, but exhibited in drawings the actual construction of his motor, and gave some data in regard to the practical results obtained at Augsburg. Professor M. Schroeter followed Diesel in further development of the theory of the motor, and gave in detail the results of tests made by him on the first experimental motor, and stated his conviction that the motor was now ready for commercial work.

Diesel's idea was to follow Carnot's cycle strictly, obtaining the lower isothermal and adiabatic curves by compression, and the upper lines by combustion and expansion. For a long time he experimented with various vapors, which, under normal con-

*Extracts from a paper read before the Massachusetts Institute of Technology by E. D. Meier, C.E., M.E.