a thing exists for the purposes of calculation, research, etc., but in reality when two equal and opposite forces meet they eventually destroy each other, and the only real force after all is "Kinetic," or moving force—it cannot be latent. I am aware of the difficulty of proving my contention. The constitution and behaviour of matter being so complex, nevertheless, their subtleties are worth studying. Take, for example, a heavy weight, hanging on, say, a rod of steel, or by a chain, we say the rod upholds the weight, and is in a state of tension. Or we take a weight resting on a column, and we say the column supports the weight, and is in compression. This is true, but when the rod has been extended, or the column has been compressed, force ceases. It was force when the extension or compression took place, because there was movement, but when movement ceased, force ceased, and until movement re-commences (which may never happen) there will be no further force exerted; the very idea of force implies action, and as long as force can overcome opposition, it exists, but when it is balanced by its opponent it is dead and inert. The fact that force cannot be measured except in terms of motion shows that there is no force without motion.

The Dominion's Engineering Trade.

(By F. Cooper.)

It has been stated that there is no better barometer to gauge a country's prosperity or decline than the condition of its engineering and iron industries, and, considering that the advance of nearly all other industries is immediately reflected back upon that of engineering, there appear to be good grounds for the statement. The universal application, however, is nullified considerably in this country by the Gilbertian position of an industry carried on under practically free trade conditions, having to do so with protected labour; a considerable handicap when compared with our competitors, who have the advantage of a protected industry carried on with free labour. Our captains in the Dominion's engineering industry no doubt appreciate the compliment implied, but unfortunately the results of the peculiar position are shaping to such disastrous ends that an exchange for a less complimentary, and a more common-sense position would be more acceptable by those interested.

It is difficult to conceive the equity of isolating an industry so important to a community as that of engineering from the protection so necessary for any industry carried on under the unique position brought about by our legislators, a protection granted to most other industries carried on in the Dominion. Farming, woodworking, furniture, printing, woollens, coachbuilding, cement, are all more or less protected and flourishing. This all tends to upset the application of our opening remarks. Engineering can only advance side by side with other industries when placed on an equal footing; that the industry is not advancing the following figures will prove, and at the same time indicate how the profits of the industry are disappearing:—

In 1908 the number of hands engaged in the industry increased by 99 over the preceding year, and the wages had increased by £47,057.

In 1909 the hands increased by 94, and the wages by a further £45,936.

In 1910 the hands decreased by 469, and despite such decrease the wages increased a further £26,001, or, in the 3 years a gross decrease in the number of hands by 276, with increased wages paid over the 3 years, amounting to £118,994.

In 1906, the last census period there were 4729 hands receiving an average annual wage of £88 per hand.

In 1910 there were 4683 hands, receiving an average annual wage of £114 per hand.

This declining position is further intensified when considered in relation to the population, as during the time the hands engaged in the industry decreased by 267, the population of the Dominion increased by 73,607.

In 1907 there was one hand employed in the industry to 184 of population; in 1910 it was one to 211.

It is safe to say that the extra facilities in the shape of plant and improved methods are not a factor, as there is no doubt but that the condition of the industry has cramped expenditure in this connection. The number of hands in all factories of every description over the three years shows a decrease of 819, 276 of which was in the engineering trade. The importations of engineering products are heavy, but it cannot be laid to lack of enterprise or ability on the part of those engaged in the industry. This is evident by the testimony to our engineers' abilities to be observed all over the Dominion, including such items as locomotives and waggons, stationary engines and boilers, sawmill plants, steamboats, steel bridges and other steel structures. Mining and dredging machinery, agricultural implements and machines, including threshing and chaff-cutting machinery, oil and gas engines, tramway cars, dairying and milking machines, hydraulic and other power lifts, suction and producing gas plants, wind engines and numerous other engineering productions, comprising a varied collection of infinite credit to a country of only one million souls, and comparing in quality to the best imported.

It behoves those in power to so adjust matters that this industry should receive a very necessary consideration and utilise to the Dominion the undoubted facilities that are here in the shape of artisans and plant for the enrichment of the country, as well as to utilise the energies and abilities of the many youths who are being educated at our colleges and technical schools, a factor which under present conditions is being alienated from our use by lack of opportunity, and what is possible, further building up the industry in competing countries to our further undoing.

At a time like the present, when we are with pardonable pride exhibiting the manufactures and products of the Dominion, it is regrettable that so important an industry as that of engineering should be suffering from legislative restrictions to its undoing, when the very industrial existence of the country is so bound up in its necessary progress.

During the four years previous to, and including 1909, there were imported into the Dominion gas and oil engines to the Customs value of £362,021. This, with freight charges, etc., would represent a local expenditure of about £543,000, or £135,750 per annum. What is there against this amount being reserved to the country by a protective tariff? It contributed £24,000 as duty.

During the four years previous to, and including 1909, there were imported into the Dominion mining and dredging machinery to the Customs value of £191,325. This, with freight charges, etc., would represent a local expenditure of about £287,000, or £71,000 per annum. What is there against this amount being reserved to the country by a protective tariff? It contributed £3564 as duty: less than 2 per cent.

During the four years previous to, and including, 1909, there were imported into the Dominion agricultural and dairying machinery, of a Customs value of £670,000. This, with freight charges, etc., would represent a local expenditure of about £1,000,000, or £250,000 per annum. What is there against this amount being reserved to the country by a protective tariff? It contributed nothing in the shape of duty.

In the four years previous to, and including 1909, there were imported into the Dominion portable and traction engines of a total Customs value of £104,054. This, with freight charges, etc., would represent a local expenditure of about £156,000, or £39,000 per annum. What is there against this amount being reserved to the country by a protective tariff? It contributed nothing in the shape of duty.

The Stone Quarrying Industry.

(By Theodore Arnold, M.E.E.)

The enactment of "The Stone Quarries Act 1910" directs attention to the importance of this industry in this Dominion. The Anderson's Bay quarries at Dunedin are claimed to possess the most up-to-date appliances, as well as the best stone for general purposes. In the Dominion no granite is found, the best rock found being of the Trap species. The term "Trap" is derived from "Trappa," the Swedish name for stair, and is applied to this rock because rocks of this class frequently occur in large tabular masses, rising one above another like steps or stairs. Basalt is one of the best varieties, and an excellent deposit of this nature is found at Anderson's Bay. It is a dark green stone, composed of both augiste and felspar, very compact in texture, and of considerable hardness. Basalt itself is an Ethiopian word, for iron, hence its application to this particular class of stone. Trap rock is a large group of igneous rocks allied to granite, and is composed of felspar, augite and hornblende. Felspar is opaque, yellowish in colour, composed of silicuous and aluminous matter, with a small proportion of potash.

The principal uses of these rocks are for paving and macadamising. They are vastly superior to flinty stone, which, though hard, is brittle, and easily reduced to dust by the attrition of traffic. It may always be recognised that granite, and granity stone is the best road metal procurable, and flint and flinty stone the very worst.

At the Anderson's Bay quarries, the boring of the rock for blasting purposes is performed by the Giant rock drills, made by the Ingersol Rand Company, which are driven by compressed air. Hammer and drill work, the dull and dreary old method, is here a thing of the past, and six holes can be driven by a Giant drill in the time formerly occupied in drilling one. The method of blasting, too, is an advanced one. Time fuses are discarded, and electric detonators used. The result is total immunity from danger from blasting to the workmen, and a considerable saving of time. When the holes are charged and ready for shooting, it is only necessary to remove the men from the danger zone for half a minute while an electric spark is transmitted to the charge, and the blast has taken effect, and work is resumed. The stone is conveyed from the quarry to the quaratory stone-cutters by tramlines, the cutters being machines by Jacques (for screenings), and by Austin (for metal). For power, electricity is used, the works being supplied with three electric motors of 50, 30 and 15 b.h.p. respectively. The Dunedin Corporation possesses a quarry of excellent stone, which is, however, difficult to work, on account of the excessive amount of overburthen, or stripping, necessary to be removed before the stone is accessible.

Queries.

What is the difference between an object moving through still air at the rate of 10 miles an hour, and a breeze blowing at the rate of 10 miles an hour against the same object stationary?

Answer: Whether the pressure against the object is obtained by the object moving or the wind moving is immaterial. The pressure would be exactly the same in either case.

Patents.

Paper read before the Canterbury Engineering Society by Mr. Climie.

(Continued.)

Having briefly touched upon the origin of patent law, we will now proceed to consider the essential of a patentable invention.

For sake of convenience, patentable inventions may be divided into the following classes:—

1. New and useful machines for new or old purposes and improvements in existing machinery;

2. New and useful combinations in mechanical parts and of materials;

3. Improvements in existing manufactures, processes, or parts of processes;

4. Novel and useful results and products of manufactures and processes;

5. New or improved processes for which