the other end of each valve chamber the cover is fitted with a cover having a spindle projecting into the end of the valve, which is bored and bushed with hardened steel to receive it. In this way the valves are practically carried on trunnions, the contact between each valve and its face being only just sufficient to insure tightness. To enable the pressure of each valve on its face to be adjusted, the valves are made very slightly taper, so that they can be adjusted endways. Valve made in this way have proved most durable in practice, the spindles and bushes remaining quite steam-tight after many years' use. At Messrs. Adamson's own works valves thus fitted have been in use over six years, working with 90 lb. steam, and are still perfectly tight.

The manner in which the valves are actuated will be understood on reference to Figs. 4 and 5. From these it will be seen that each main valve spindle has keyed upon it a lever, and these levers are coupled to the eccentric rod, which gives to the main valves a motion corresponding to that of an ordinary slide valve. To each main valve spindle is jointed a stirrup link provided on its underside with a hardened steel catch which engages a corresponding hardened block on the end of the vertical arm of a bell-crank lever keyed on the corresponding cut-off valve spindle. The horizontal arm of the bell-crank just mentioned is coupled to a spring which tends always to pull the cut-off valve into its shut position. By means of the stirrup link and catch above mentioned, the cut-off valve is pulled open by the movement of the corresponding main valve lever, this movement continuing until by the action of a cam controlled by the governor the catch is disengaged and the cut-off valve closed by the action of the spring. The work thrown upon the governor by this gear is very light and the gear is very sensitive, giving a most efficient control of the engine. The governor is of a high-speed pattern. Altogether the engine is a most interesting one. We may mention that Messrs. D. Adamson and Co. have lately completed six pairs of compound engines of this type for the new works of the Sugar Manufacturing Company at Kilbowie, near Glasgow.—*Eng.*

MR. TAYLOR'S EXPLANATION.

To the Editor of the Canadian Magazine.

Sir: The undersigned claims the discovery of the following truth, viz: If one of the legs of an isocelese triangle be at right angles to a given straight line, that the linear measure of the sides of said triangle is the length of the trisecting line which divides the angular difference between the vertical angle and the right angle.

The outer end of the said trisecting line must be raised to the same altitude as the intervening lower limb of the isocelese triangle; then the angle on one side of this trisecting line will be double the adjacent angle on the other side of it.

The construction: Let A,R,T, be a right angle; and triangle A R H any part of that angle; draw U T parallel to A R; make H R equal to T R; join H T; R T H is an isocelese triangle. Draw H Y parallel to A R. The line R O divides the required angle A R H into two parts, one of which is double of the other, for the line O R is within the angle, and its length is equal to H R, plus R T, plus T H; and O touches the parallel H Y.

The construction and demonstration is analogus to that employed in proof of the trisection of a right angle. Similarly any angle of a triangle may be quinquisected. The base of the isocelese triangle, associated with the trisection of a right angle, is zero. All lesser angles are similarly trisected, but with this difference, viz: they are allocated with an adjacent isocelese triangle, having a positive base.

ARTHUR McN. TAYLOR.

Fredericton, May 28, 1885.

IRON MAKES WAY FOR STEEL,

Few people not actually engaged in the metal trade are aware of the wonderful strides made by steel in recent years. In fact steel is wholly taking the place of wrought iron. Steel is simply a mixture of iron and carbon, the quantity of carbon ranging from .25 to .20 per cent. of the mass. It is not only stronger and, for almost every purpose, better than wrought iron, but it is cheaper.

Its first victory over wrought iron was obtained in England, where steel rails for railroads were found to be much better than iron in several ways. They did not wear away so rapidly under the wheels, and they were able to stand a greater strain. The first Bessemer steel plant in this country was started in 1867. Its product was used for making rails, and the total amount for that year 3,000 tons. For a number of years the Bessemer steel was almost wholly devoted to that purpose, the high price at which it was sold making it unprofitable for other uses to which wrought iron was put. Steel rails brought $160 a ton in 1867, but after the panic of 1873 prices came down, and in 1875 the rails brought $75. The hard times of 1879 lowered the price, in spite of combinations among owners, and in 1883 steel rails sold for $40 a ton. Since that time the price has fallen steadily, and a recent price list puts the price of rails at $29, and of steel slabs, ready to be rolled or forged into any shape, at $28 per ton.

The result of these low prices is that bridges are no longer made of iron. Steel beams have taken the place of iron in the fireproof buildings. Steel ships are built instead of iron ships. Steel boilers replace iron boilers. Steel rifles replace the old cast iron cannon. Wherever tensile strength is required, steel is used. Although no iron rails are made now, there are still a few old iron rails in use. As fast as worn out they are replaced by steel rails.

The use of steel in beams and girders for houses and bridges was a natural sequence of their use in railroad tracks. But the use of this steel has not been confined to railroads and steamships. The big tin plate factories in Wales began to experiment with steel instead of iron about two years ago. Tin plate contains about 93 per cent. of iron and 7 of pure tin. The steel plate was found to be cheaper, and the articles made of steel tin plate were superior. For making tin dishes without seams or soldered joints, the Siemens process steel plate is not only superior, but is about the only kind that can stand the spinning process. This country now imports 240,000 tons of tin plate annually, and it is all made of steel plate with a tin coating.

One field in which steel has not yet wholly displaced iron is in the manufacture of nails. The plates from which nails are cut can be rolled from steel ingots as easily as from puddled iron, but the steel plate is harder to cut and the cutters charge a little more for the work. The plants engaged in making steel nails are limited in number, and the price of steel nails is higher than that of iron. The steel nail is smoother, stronger and handsomer, and has made its way in spite of the higher price, but the difference in price is rapidly dwelling, and will not doubt, soon disappear altogether. In November, 1884, the Wheeling manufacturers charged thirty cents and the Troy men twenty-five cents a keg more for the steel nails. Quotations during the last of February this year were $2.10 per keg for steel nails and $2 for iron. The profit to the manufacturer of the steel nails is much greater on account of the smaller cost of the plates, and the only thing that prevents the iron nail-makers from using steel plates entirely is that it takes money to change the plant, and after the great depression of the past two years, money is not over abundant among iron manufacturers in any branch of the trade.

A curious outgrowth of this improvement in the manufacture of nails is the action taken by the trades unions in the West at the instigation of the puddlers. By the old puddling process of making iron plates for nails, the pig iron was melted mass with long rods until the impurities were burned out and the iron became pasty instead of liquid. By the new process the melted pig iron, in a big pear-shaped kettle, is subjected to a powerful blast of air, which is forced up through it from the bottom, until the impurities are burned out. Then another small amount of melted pig iron is poured in and the mixture is ready to be cast into ingots. By the old process twenty skilled men could turn out fifteen tons of nail plate in a day, while by the new process four common laborers and one skilled mechanic can turn out from 150 to 250 tons in a day. Naturally the puddlers must lose their occupation. They have induced the Contractors' and Master Carpenters' Association of Wheeling to boycott the steel nails, and all union builders will be asked to boycott them also.—*New York Sun.*

The United States has 17,000 dentists, who use a ton of gold and five tons of other metals and make 4,000,000 artificial teeth annually. Only one American in eighty is found to have perfect teeth, and one-third of the population make more or less use of the artificial product.