INTERCOLONIAL RAILWAY BRIDGE AT RIVIÈRE DU LOUP.

We are indebted for the following particulars to Mr. Hazelwood, late engineer of the St. Lawrence District. It is built on the "Howe Truss" principle. It was designed by Mr Sandford Fleming, the chief engineer of the Intercolonial Railway, and is composed of three spans of 100 feet each, with roadway on top. The depth of the truss is 18 feet, and the road-way above the bed of the river 40 feet. This bridge is supposed to be one of the strongest Howe trusses at present in existence. There is a little bridge of 30 feet span on the west side of this one, but connected with it, for the purpose of carrying the railway over the Temiscouata road. The Rivière du Loup and Isle Verte bridges, together with the one over the Eissiquash River, in Nova Scotia, are the only wooden bridges on the entire line of the Intercolonial Railway. They were built before the commissioners consented to comply with the suggestions of the chief engineer to have them all of iron Our illustration is from a photograph by Mr. W. A. Campbell, of Rivière du Loup, *en bas.*

LEONARDO DA VINCI AS AN ENGINEER.

This was the title of a lecture by Mr. A. Hildebrandt, C.E., delivered before the members of the Scientific and Mechanical Society Leonardo da Vinci is generally accepted as a great painter and sculptor, but of his other qualities little or nothing has been known Dr Herman Goathe, of Berlin, has recently published a brochure based upon the study of da Vinci's M.S S, which are deposited in the libraries of Italy, Paris, and London, showing that the man was really a universal genius; and if regard be had to the time in which he lived, he was one of, if not the most wonderful man which our planet ever produced The brochure, which he illustrated with woodcuts copied from Leonardo's sketches, and one lithographed facsimile of a machine with all its details and explanations in Italian, written from right to left—one of his peculiarities—formed the text of the lecture from which we gather the following.

Leonardo da Vinci lived from 1452 to 1519, was born in Florence, where he acquired a knowledge, among other things, of weaving, metal founding, and metal work, such as goldsmithing, which were considered by his master to be necessary preliminaries to painting and sculpture, in which latter he made such rapid progress, that after having painted an angel in one of his master's pictures the latter put down his brush and pallet to take it up no more. We know what a high position Vinci afterwards occupied in the artistic world—that he stood on a level with Michael Angelo, his contemporary. It is not unnatural to assume, with our present-day experience, that to acquire such excellence an absolute specialty must be made of the particular calling, but the contrary fact is one of the most striking features of the old master. To what a state of perfection he brought music may be inferred when we are told that he went victoriously from a competition for the place of first violinist to the Duke Ludwig Mario Sforza, who thereupon called him to Milan in 1484, not without wanting and finding in him the greatest painter and inventor of Italy. He there founded an academy of science, he painted world-famed pictures—such as the 'Last Supper," which still exists (at least in copies)—he modelled the equestrian statue of the Duke's father (which, unfortunately, has got destroyed), he was the Duke's military engineer, and the part he took in architectural work cannot have been a small one, when it is due to his influence that the then prevailing style of late Gothic gave way to Roman and Greek. He wrote several works on painting, light and shade, and other tracts, and designed improved machines and implements, studied anatomy—which he considered indispensable to the painter—and experimented and studied nature generally, which resulted in his philosophical reasonings and tracts exposing him at the same as a free-thinker, to which he really aspired in reference to the then prevailing dogma of the Church relative to the form of the earth. He adapted, about this time, the Martesana canal for navigation, and constructed two others for irrigation. Having left and returned to Milan several times after the removal of the Duke Ludwig Sforza, occupied in various capacities as retired philosopher, private painter and sculptor, painter to the king of France, as engineer-general of fortifications in Florence, Sienna and France, he designed in the last two years of his life the canal of Ramorantin, which was carried out after his death. He was buried in Amboise: Napoléon III, in 1863, caused a memorial to be erected to him after his grave had been again discovered, and a monument was also erected to his memory in Milan.

As a philosopher, no doubt is entertained that all or most of the various discoveries recorded in his MSS. are his original ideas, as they entirely differ from the theories of Aristotle, who lived long before him, and conform very closely with the notions accepted in modern times, which are almost invariably accredited to the period of Galileo, who lived much later (from 1602) His knowledge of the laws in natural science is mostly evident from his application of the same to his every day practice He was an acute mathematician, the invention of the signs + and — is assigned to him, as being one of the first to make use of them. He attempted to square the circle, but gave up the attempt, as it was "impossible to do it with absolute accuracy." He studied and wrote much of perspective, and laid down rules, which hold good at the present day He was well acquainted with the laws of the lever, and made familiar use of them, this applies also to the inclined plane, and his pulley blocks were in continual use. He had also a very clear notion of the weight of bodies and of the law of gravitation His laws of motion do him credit, and the *perpetuum mobile* is studied and condemned in no doubtful terms He studied the strength of materials, and seems to have been conversant with the laws of friction. In hydraulics he was particularly at home, as may be inferred from his practical works of canal construction, his water-wheels and turbines are admirable, and the laws upon which the hydraulic press is based were perfectly clear to him. He also investigated the waves of fluids and sound, he bored artesian wells and constructed pumps. How well he understood the laws of combustion will be understood when we are told that he was the first to make use of lamp chimneys, and several sketches of candle flames prove that he had hold of the right principle He occupied himself, also, with diving and attempts at flying, and devised apparatus for these purposes. It is, further, more than probable that Leonardo was the inventor of the camera obscura, and his knowledge of astronomy deserves no less attention especially with regard to the sun, the moon, and the earth, and his ideas, although not as definitely expressed as in modern times, are not at variance with what is now known Nor was botany neglected by him; he also made the first attempt to cut figures in wood, *i. e.* wood engraving.

It is not presumed to credit him with the invention of all the various machines of which sketches are found in his MSS., but to say that he made himself acquainted with the same to such an extent as the records show, is almost more than the first engineers of the present day can be expected to attain, to say nothing of the fact that he did design some of them and improve others, and his studies of the various mechanism are of the most interesting kind, and embrace almost all devices known at the present day That he was well acquainted with the properties of iron is certain, for in his MSS. is preserved a drawing which is, in all probability, an original design to stretch it, in fact, a rolling mill, to make the segmental sectioned bars from which he made his cannons. He was undoubtedly an eminent metallurgist of his time. Among his other machines are a boring machine for wooden pipes, such as were and are still used for waterworks, an attempt to construct a planing machine, a file-cutting machine (beyond which, says the author, we have not yet got much), a saw for stone and wood, and a very perfect spindle arrangement for spinning. machines to make ropes, not differing materially from those in use at present, cloth-shearing machines, looms, hammers, draw benches, lifting apparatus and cranes, chains, dynamometers, and many others Primitive though many of them be, some compare favourably with those in use at the present day.

WATERPROOFING CLOTH.—Tweed cloth can be made waterprof by the following method: Into a bucket of soft water put ½lb. sugar of lead and ½lb. powdered alum, stir this frequently until it becomes clear; pour off the clear liquor into another bucket, into which put the garment, and let it stand therein for twenty-four hours, and then hang up to dry, without wringing it, when it will be found to be completely waterproof (proved.) This is preferable to the ordinary Macintosh waterproof, as it does not impede the perspiration.