or sheet ice forms over the surface of quiet lakes or rivers, and is desirable or not, depending on the particular conditions. Specular ice—or as it is called in Canada, frazil ice—is formed by surface agitation in the more turbulent rivers and in waterfalls, and accumulates in great quantities in the quieter waters. It is this form of ice which gives the most trouble in hydraulic work. Anchor ice, or ground ice, is the most interesting; from the fact that it grows along the bed of a river not protected by surface ice, and often causes considerable inconvenience when it rises in great masses, carrying up with it boulders and stones of considerable size. Anchor ice is formed in the first instance, by radiation of heat during a cold clear night, but increases to great depths by entangling and freezing large quantities of the frazil ice carried down by the shifting currents. A study of the temperature conditions in the water during the production of these forms of ice shows that this is accompanied by a small temperature depression in the water amounting to a few thousandths of a degree Centigrade. During the severe weather the water is thus thrown into a slightly super-cooled state, during which time the ice crystals are growing rapidly by continued freezing, and give rise to the agglomerating stage, when they stick together in lumps and spongy mases, and adhere to the racks or to the machinery of the wheel gates or turbines. So firmly does the ice freeze that it will interfere in a short time with the operation of the machinery, and cause a temporary cessation of operations. The rack bars frequently become clogged with ice, and cut off entirely the supply of water. Fortunately it is only a small temperature depression which brings about these conditions, and methods of artificial heat, applied about the affected spots, are found to effectively relieve the situation. The sun is the most powerful agent in preventing the troubles, since the absorption of the heat rays prevents the state of super-cooling. At night, however, it has been found most important to have available a system of steam injection, or electric heating, which can be readily applied about the machinery, in order to prevent it from becoming super-cooled. It is not found necessary to warm the entire volume of water passing through, which would be very costly and difficult; but by applying the heat in the racks of wheel cases, or blowing steam about the affected parts, the ice is prevented from gaining a foothold. The ice is as effective as so much water in producing a head; hence the necessity of passing it through, and not allowing it to freeze to the metal surfaces of the machinery. In places where the steam injection system is installed no trouble is experienced, even in the most severe weather, thus completely demonstrating the feasibility of coping with a situation which, for many years, has been regarded as involving inevitable interruption to the continuous operation of the plant.

To my former confreres of the Ottawa Electric Company, who erected the small frazil combating plant, and who so willingly helped to operate it at a time when the attempt was generally regarded as ridiculous or foolhardy, I beg to tender my best thanks.

ECLIPSE SYSTEM OF ROOF GLAZING.

A system of Messrs. Mellowes & Company's, Limited, Patent "Eclipse" Puttyless Roof Glazing is of special interest to railway engineers, engineering firms and architects.

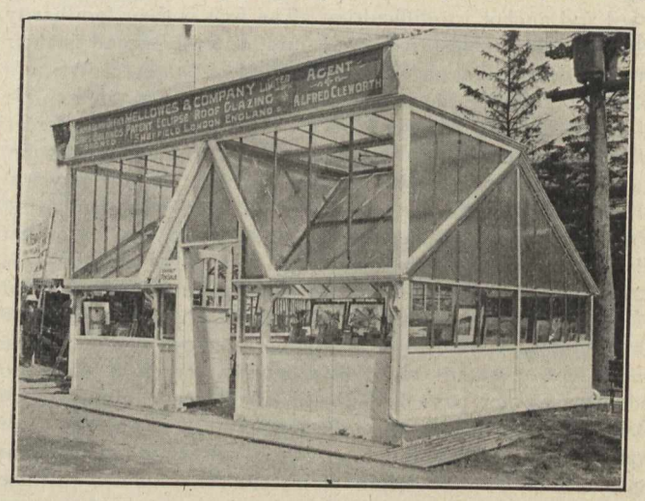
The feature of this steel bar is, that it is absolutely imperishable, being covered with a strong "Eclipse" metal cove which is soldered at both ends, thus preventing any rust or weather getting to it. Neither zinc, putty nor paint is required. Snow or rain cannot possibly drift in between the glass and the woodwork, owing to the existence of a lead windguard which is fixed underneath the bottom of the pane and between the bars.

Often for a few years a roof will give satisfaction, but afterwards trouble, owing mainly to the unsuitability and perishable nature of zinc, sheet iron and other bars.

The use of this bar for over 25 years on railway stations, engineering works, baths, dye works, and other buildings, subjected to the worst atmospheric conditions that could be selected, go to prove that it is imperishable, and entirely unaffected by atmospheric action.

The perfectly water-tight condition of this system of roof glazing, also the keeping out of dirt and dust is due to the existence of three webs, which (unlike either zinc or copper), are rubbed firmly against the glass, two webs above and one below.

The accompanying view is a photograph of Mellowes & Company's, Limited, exhibit just recently shown at the Toronto Exhibition, where practical demonstration of water flooding the roof, by means of sprinklers, were given daily.



Mellowes & Company's Exhibit at the Toronto Exhibition.

Estimates and fullest particulars will be freely given on application to their Head Office, 28 Victoria Street, Westminster, London, or to the Canadian Agent, Alfred Cleworth, Janes Buildings, Toronto.

THE PANAMA CANAL.

The Panama Canal cost the United States $84,449,000 up to December 31st, 1906, according to a statement of the audited expenditure just published. The bulk of this expenditure was the $50,000,000 to the French company and the Panama government for canal property, right of way and franchises. Just $3,949,033 went for material and supplies. For general administration there was expended $1,124,200; government and sanitation, $4,381,089, and construction and engineering, $9,972,552. Other expenses include $2,138,852 under the head of plant, which embraces rolling stock machinery, second main tracks, etc.

There is to be constructed at Southampton, England, the deepest open dock in the world. Exclusive of the quays and cargo sheds, the dock will cover an area of sixteen acres. The site chosen, admirably adapted for the purposes of a vast ocean trade, comprises the greater portion of the reclaimed land lying between the Empress dock and the Trafalgar Graving dock. Forming an oblong square, the water area to be created will be 1,700 ft. long, and a uniform width of 400 ft. is stipulated. The outer walls will be prolonged into the River Test, somewhat beyond the present boundaries, and the additional quay space secured will offer berths for eight of the largest vessels afloat. Alongside the existing deep-water quays in the Test—the scene of so much naval and military activity during the war in South Africa—there is already a depth of 32 ft. at low water of ordinary spring tides, but the dock designed will be capable of being dredged so as to give, under similar conditions, a depth of not less than 40 ft., increasing to 53 ft. at high water. Inside the dock will be berths for four vessels each about 800 ft. long, and these can enter or leave at any state of the tide. In respect of no existing dock at home or abroad can a like claim be sustained, and Southampton will, therefore, enjoy supremacy among British and foreign ports in its provision for the immense passenger and cargo steamers that form such an important element in the mercantile marine.