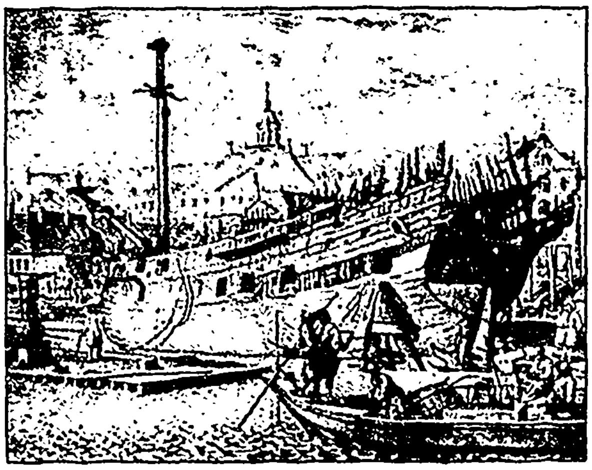
have been at best but poor affairs. To make the piston work sufficiently accurate and tight, and to keep it so, must have been a work of no small difficulty.

The Germans were proverbially in advance of the rest of Europe in the 15th, 16th and 17th centuries, in almost every department of the arts. "The excellency of these people (observes Heylin in his Cosmography) lieth in the mechanical part of learning, as being eminent for many mathematical experiments, strange water works, medicinal extractions, chemistry, the art of printing and inventions of like noble nature, to the no less benefit than admiration of the world." As early as A.D. 1518, some kinds of fire engines were used in Augsburg, being mentioned in the building accounts of that city. They were named "instruments for fires," and "water syringes useful at fires." Their particular construction is unknown, but from a remark in the accounts respecting wheels and poles, they are supposed to have been placed on carriages; they were probably large syringes and mounted like the one previously represented.



This engraving represents a Dutch East India Co.'s ship in front of their docks at Amsterdam. Fire was discovered at 2.30 p.m., May 11th, 1690. As all the people were attending the Feast of Pentecost, it was an hour and a half before the hand pumps arrived. The engraving, which is reproduced from an old copperplate, shows the ship after the fire.

The oldest pump engines of modern times were certainly made in Germany, and about the close of the 16th or beginning of the next century. The first one noticed by Beckman is that of Hautsch, which the Jesuit Schottus saw tried at Nuremberg, in 1656. In giving an account of it, Schottus remarks that the invention was not then new, it being known in other cities, and he himself remembered having seen a small one in his native city (Konigshofen) forty years before, consequently about 1617. We are not informed by either the professor or Jesuit of the particular construction of this small engine, but there is a book extant that was published in 1615, which contains a figure and description of a German engine of that time, and which furnishes the information desired. This book is the "Forcible Movements" of Decaus, a work which, like "The Theatre des Instrumens of Besson," escaped the notice of Beckman. I have cuts photographed from the engine in my possession.

This machine is named "A rare and necessary engine, by which you may give great relief to houses that are on fire." I give the whole of the explanation: "This engine is much practiced in Germany, and it hath been seen what great and ready help it may bring, for although the fire be 40 feet high, the said engine shall there cast its water by help of four or five men lifting up and putting down a long handle, in the form of a lever, where the handle of the pump is fastened. The pump is easily understood; there are two suckers (valves) within it, one below to open when the handle is lifted up, and to shut when it is put down, and another to open to let out the water; and at the end of the said engine there is a man which holds the copper pipe, turning it to and again to the place where the fire shall be." In other words, this was a single forcing pump, and secured in a tub. For the convenience of transportation the whole was placed on a sled, and dragged to a fire by ropes. The bore of the forcing pipe seems to have been small compared with that of the pump cylinder, a circumstance, combined with the long lever and number of men employed in working the latter, that contributed to increase the elevation of the jet. This machine exhibits a decided improvement on the primitive syringe, and constitutes a great step towards the modern engine. In the short angular tube to which the jet pipe is attached, we behold the germ of the more valuable goose-neck.

Continued in next issue.

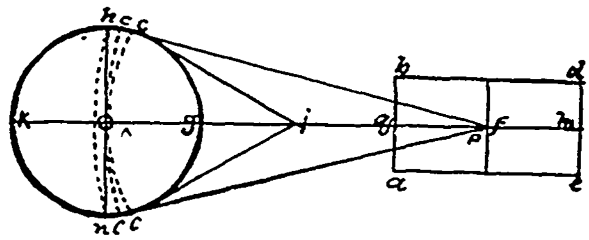
For THE CANADIAN ENGINEER.

THE PISTON PROBLEM.

BY C. BAILLAIRGE, CITY ENGINEER, QUEBEC.

At page 40 of the issue of this journal for June, 1894, is an answer by G. Sinclair Smith, of the McGill University, to a query by a "London Subscriber" as to whether a piston of a "steam engine that is connected in the usual way by crosshead and connecting rod to a crank plate, travels faster in one end of the cylinder than in the other, the fly-wheel running at a regular speed?"

Mr. Sinclair has solved the problem in a no doubt elegant, but scientific manner, and of which not one mechanical engineer out of ten or a hundred can do more than see the result arrived at, to wit: that with a connecting rod, *f g*, equal in length to 4 times that of the crank, *o g* or *o c*, the first half, *f m*, of the cylinder in the forward stroke will be travelled over in $\frac{44}{100}$ of the whole time of transit of piston from end to end, *m q*, of the cylinder, *a d*, leaving $\frac{56}{100}$ of the time to travel over the remaining or second half, *f q*, a total difference of $\frac{8}{100}$ or 12½ per cent. and that the difference will



be greater proportional to length of connecting rod, and *vice versa*.

Everyone likes such a demonstration of any problem, when possible, as his eye can take in and follow up and the mind grasp and lay hold of; while only the eye of faith can be relied on either by the author himself or the reader of an abstruse algebraic solution like that of Mr. Smith.

Let, then, *a d* be the cylinder and *f* its centre, or the middle of its length of stroke of piston. The connecting rod *g m* = four *o g*, or of whatever length it may be. When the piston has arrived at *f*, the connecting rod *g m* will occupy the position *c f* = *o f*. Now *c f* in the isosceles triangle is less, by *c h*, than the hypothenuse *h f* in the right angled triangle *h o f*, and the piston has already arrived at half its stroke; therefore, the