weight of these parts, 76 pounds. The valve was 3⅛ inch diameter. Where should the pea be placed on this lever to be in equilibrium with a steam pressure of 60 pounds per square inch?

Area of 3⅛ inch valve is 7.76 square inches; total pressure on it at 60 pounds per square inch is 460·2 pounds. This is the resultant or intermediate force in the system, and, according to the principle set forth, is equal in amount to the sum of all the others, of which one, viz., the pressure on the pin or its equivalent weight, is not given, but is found by subtracting the sum of the known weights, in this case 76 pounds, from the total of 460·2 required; the remainder, 384·2, is the equivalent pressure in pounds due to the resistance of the pin.

The question now becomes, where should the pea or weight of 62 pounds be placed on this lever to be in equilibrium with a weight or pressure of 384.2 pounds placed on the lever at a distance of 4⅝ inches from the axis of the valve, or fulcrum, if you please to call it? This is solved on the principle of the equality of inch pounds on each side of a lever in equilibrium. In this case there is one product on one side of the fulcrum and two on the other.

Inch pounds on the pin side of the fulcrum: 384·2 × 4·625, is equal to 1776·925. On the other side of the fulcrum the sum of the inch pounds of the two components must be the same. Lever 9⅛ pounds, balancing at 11⅝ inches from the axis of valve, is equal to 106·078125. Subtracting this from 1776·925, leaves 1670·846, which is the product of the weight of the pea by its distance in inches from the axis of the valve. Then 1670·846 divided by 62, gives a quotient of 26·94, which is the answer to the question in inches from the axis of the valve, or 31·57 inches if measured from the centre of the pin-hole.

In this manner any similar question is answered. Sometimes government examiners put the question in this form: On the same valve the pea weighing 62 pounds is placed at 35 inches from the centre of pin hole: At what pressure will it be ready to blow off? Here the pea is located at 30⅜ inches from the valve axis. The sum of the inch pounds on that side of the fulcrum or valve axis is 1989·33; this divided by 4⅝, the distance in inches between the valve axis and centre of pin-hole, gives us 430.125, which is the pressure in pounds at the pin due to the weight being placed at 35 inches from the pin-hole. The total weight or pressure on the "sit" of the valve is 506⅛ pounds, this being the sum of the weight of the parts and the pressure on the pin, and this amount divided by the area of the valve in square inches, gives us 65·987 pounds per square inch, which is the answer to the question.

A neat and clever solution of this problem is based on an extension and application of the same principles. The centre of gravity of a body or a system of bodies is merely a particular case of parallel forces. It is an acknowledged truth that as far as gravity is concerned a body or a system of rigid bodies acts as if its whole weight was concentrated at its centre of gravity. This method begins with an abstraction, or a supposition merely, for the purpose of making a start, but it is soon wiped out. No attention is paid to the individual weights of the pieces or where they balance. The collective weight of all is only required, and as I shall use the data given in the first problem, this amounts to 76 pounds. Imagine lever pea and valve to be in position, but without weight; where should a weight of 76 pounds be placed on the lever, to be in equilibrium with a pressure of 60 pounds per square inch on a 3⅛ valve, or to put a pressure of 460.2 pounds on the "sit" of the valve.

It was found in the first problem that in effecting this result there was 1776.925 inch pounds on each side of the axis of the valve. This amount remains a constant for that valve, as long as we are dealing with a pressure of 60 pounds per square inch. Now, 1776.925 divided by 76 gives us 23.38, which, under the supposition made, is the distance in inches from the valve axis that a 76-pound weight should be placed on the lever, to be in equilibrium with a pressure of 60 pounds per square inch. Or to put this in another form, in producing a pressure of 460.2 pounds on the "sit" of the valve, the distributed effect of the weight of the parts in the system is the same as if the whole weight of 76 pounds was concentrated at a point on the lever 23.38 inches from the axis of the valve. Here a reasonable question might be asked: What is the use of this in an engine room? It has a use. This distance of 23.38 inches from the axis of the valve is to be accurately marked on the lever, and with the valve placed on the lever in its working position, or, if necessary, hung by a string from the axis line of the valve; place the 23.38-inch mark on the edge of a fulcrum, or the edge of a cold chisel held in a vice. Next hang the pea on the hook end of the lever, and move it backwards or forwards until the system balances with the 23.38-inch mark on the edge of the chisel or fulcrum, as in Fig. 4.

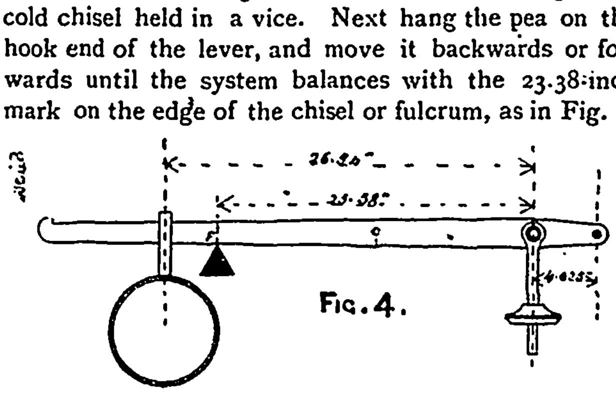
Fig. 4.

Practically and mathematically this is the true position of the pea on the lever when in equilibrium with a 60-pound pressure, and, as before, it will be found that the pea is 26.947 inches from the axis of the valve.

Looking at a model or drawing of this arrangement, it is evident that when the system is balanced and at rest its whole weight and statical effect is concentrated on the edge of the fulcrum. This is the most simple and accurate solution of the problem that the writer is acquainted with, and is far superior to the graphical method, which in this case has no advantages, and it is easier solved in other ways.

THE TORONTO TECHNICAL SCHOOL.

This school was established in January, 1892. Its principal promoters were the late ex-Ald. Gillespie, who died before the school was started, ex-Ald. Dr. J. Orlando Orr, who was the Board's first chairman, and who is at present chairman of that body; the late J. A. Wills and A. M. Wickens. At first it was felt to be somewhat of an experiment, but the success of the school has placed it in a more definite position. It is situated on College street, at the head of McCaul street, and directly to the south of the School of Practical Science, in what was formerly Wycliffe Hall. Permanent quarters have been secured here and the building so fitted as to be better adapted to the requirements of the school.

It is maintained entirely by the City of Toronto,