BOARDMAN'S COMBINED TOOL.

This tool, of which our engraving is a good representation, comprises a screw wrench, a pipe wrench, a hammer, a nail claw, a screw-driver, and a bit handle, or socket wrench.

The bit handle is the entire tool, the square socket or opening being made in the end of the handle, in which the shanks of bits may be inserted.

The screw driver is formed on the end of the screw bar, attached to the outer jaw of the wrench, and is taken out from the hollow of the handle when required for use.

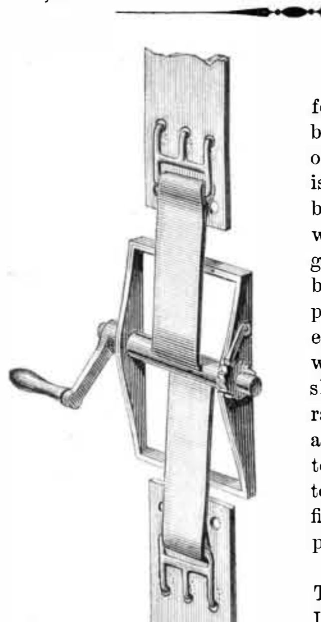
The use of the other parts of the tool will be apparent from the engraving.

The tool is very compact, and has this advantage over the ordinary screw wrench, that its leverage increases as it is opened to receive nuts of larger size.

This invention is protected by two patents, dated respectively, May 30, 1865, and July 10, 1866.

For further information address B. Boardman & Co., Norwich, Conn.

BELT TIGHTENER.



This instrument will be found of great service in bringing together the ends of belts, the weight of which is so great that they cannot be held together by the hand while lacing. A strap engages with holes made in the belt, at the back of the holes punched for lacing, the tightening strap being provided with claws or hooks, as shown. A winch axle and ratchet, adjusted in a frame as shown, are then employed to pull the ends of the belt together and hold them firmly till the lacing is completed.

This is the invention of T. G. Stansberry, of Medora, Ill. Patented in September, 1867.

Some Things I don't want in the Building Trades.

I don't want my house put in repair, or rather out of repair, by a master who employs "Jacks of all Trades."

I don't want my foreman to tell me too much at one time about the faults of the workmen under him, as I may forget asking him about himself.

I don't want a builder or carpenter to give a coat of paint to any joinery work he may be doing for me, until I have examined first the material and workmanship.

I don't want any jobbing carpenter or joiner, whom I may employ, to bring a lump of putty in his tool basket. I prefer leave the use of putty to the painters.

I don't want jobbing plumbers to spend three days upon the roof, soldering up a crack in the gutter, and, when done, leaving fresher cracks behind them. The practice is something akin to "cut and come again."

I don't want a contractor to undertake a job at a price that he knows wfll not pay, and then throw the fault of his bankruptcy on "that blackguard building."

I don't want any more hodmen to be carrying up the weight of themselves in their hod, as well as their bricks; I would much prefer seeing the poor human machines tempering the mortar or wheeling the barrow, while the donkey engine, the hydraulic lift, or the old gray horse, worked the pulley.

I don't want house doors to be made badly, hung badly, or composed of green and unseasoned timber.

I don't want houses built first and designed afterwards, or, rather, wedged into shape, and braced into form.

I don't want to be compelled to pay any workman a fair day's wages for a half day's work.

I don't want an employer to act towards his workmen as if he thought their sinews and thews were of iron, instead of flesh and blood.

I don't want any kind of old rubbish of brick and stone to be bundled into walls and partitions, and then plastered over "hurry-skurry." Trade infamy, like murder, will out," sooner or later.

I don't want men to wear flesh and bone, and waste sweat and blood, in forms of labor to which machinery can be applied, and by which valuable human life and labor can be better and more profitably utilized.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

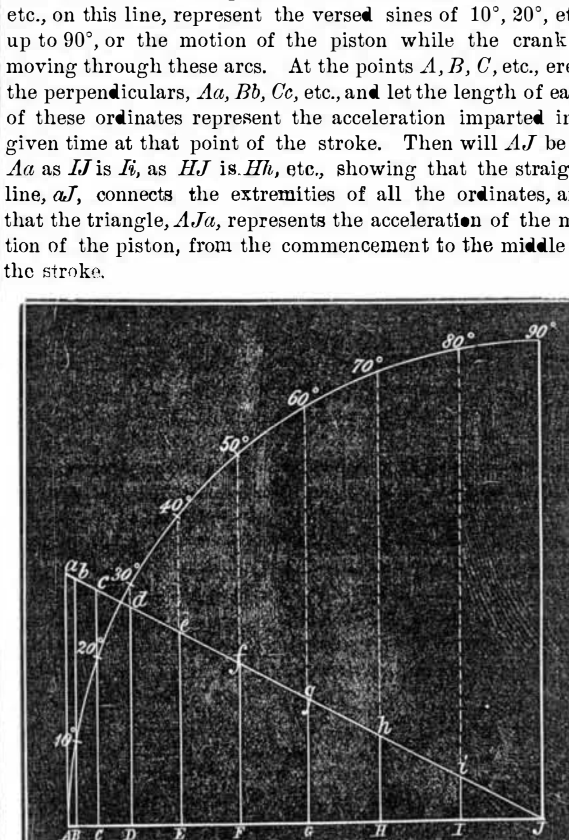
Action of the Reciprocating Parts of Steam Engines.

MESSRS. EDITORS:—I have hesitated about the propriety of replying to the criticisms of your correspondent, J. E. Hendricks, upon my paper, on the action of the reciprocating parts of steam engines. It is not to be expected that a truth so opposed to commonly received notions—the reception of which requires so much to be unlearned—should at once receive the assent of every one. Some odd fancies on the subject are likely to be ventilated first.

But your correspondent touches the root of the matter, and perhaps the fact questioned by him should be more clearly placed beyond dispute.

I will dismiss the introductory part of his letter, merely observing that his "logical inference" is quite gratuitous and unwarranted. He says himself that its absurdity is obvious, in which I quite agree with him.

The real question is this: What is the figure representing the acceleration of the motion of a piston, controlled by a crank which revolves with a uniform velocity? I stated it to be a right-angled triangle, and indicated, as I supposed, clearly enough, a simple method by which this could be shown. Your correspondent claims that the calculation, according to my own rule, gives a figure of a totally different form, and one that shows the acceleration, as well as the motion, to be reduced to zero at the commencement of the stroke. Let us see. Let the straight line, *AJ*, in the following figure, represent half the stroke of the piston, and let the distances, *AB*, *AC*, etc., on this line, represent the versed sines of 10°, 20°, etc., up to 90°, or the motion of the piston while the crank is moving through these arcs. At the points *A*, *B*, *C*, etc., erect the perpendiculars, *Aa*, *Bb*, *Cc*, etc., and let the length of each of these ordinates represent the acceleration imparted in a given time at that point of the stroke. Then will *AJ* be to *Aa* as *IJ* is *Ii*, as *HJ* is *Hh*, etc., showing that the straight line, *aJ*, connects the extremities of all the ordinates, and that the triangle, *AJa*, represents the acceleration of the motion of the piston, from the commencement to the middle of the stroke.



The following table will enable any one to make the calculations proving the truth of the above proposition:

Degrees.	Versed sine.		Motion for 10°		Acceleration during 1°	
0°		·0000000			*Aa*....	·0003046
10°	*AB*....	·0151922	*AB*....	·0151922	*Bb*....	·0003001
20°	*AC*....	·0603074	*BC*....	·0451152	*Cc*....	·0002862
30°	*AD*....	·1339746	*CD*....	·0736672	*Dd*....	·0002638
40°	*AE*....	·2339556	*DE*....	·0999810	*Ee*....	·0002332
50°	*AF*....	·3572124	*EF*....	·1232568	*Ff*....	·0001958
60°	*AG*....	·5000000	*FG*....	·1427876	*Gg*....	·0001523
70°	*AH*....	·6579799	*GH*....	·1579799	*Hh*....	·0001041
80°	*AI*....	·8263518	*HI*....	·1683719	*Ii*....	·0000529
90°	*AJ*....	1·0000000	*IJ*....	·1736482	*Jj*....	·0000000

The method of obtaining the decimals representing the acceleration for 1°, at any point, was fully explained in the paper, and compared with the similar method of showing the uniform acceleration of a body acted on by a constant force. The ordinary tables in the hand-books, going only to five places of decimals, are of no use for these computations.

I would suggest a practical experiment. Let any one having an engine running at a good speed, loosen the crank pin brasses a little, so that, at starting, it will thump heavily. Let the engine be lightly loaded, so that only a small portion of the boiler pressure will need to be admitted to the cylinder. As its speed increases, the thump will die away; and, if at its full speed, the pressure of the steam admitted is not so great as to overcome the centrifugal strain of the reciprocating parts on the crank, as it passes the centers, the engine will revolve in silence. Any one can ascertain, by the rule given in the note to the paper, just what pressure can be admitted without causing a thump, or this can be found by a little experimenting. I am running an engine which does not thump with loose crank pin brasses, under eighty pounds pressure, admitted sharply on the centers.

CHARLES T. PORTER.

Answer to Practical Problem.

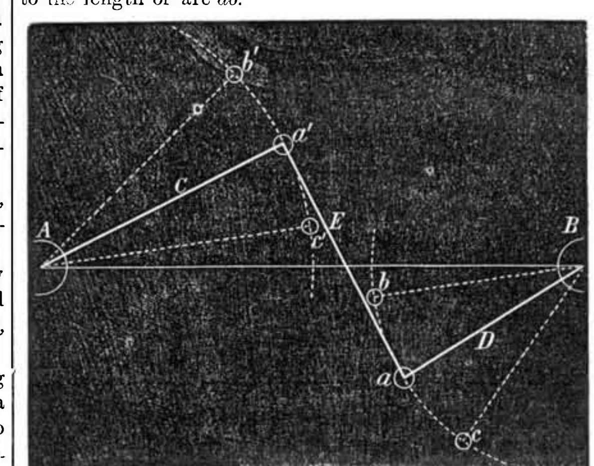
MESSRS. EDITORS;—I submit the following solution of "Practical Problem" on page 147:

Given AB, arm, C, arm, D, chord of half angle of oscillation of arm, D, and angles of arms, with line AB.

To find angles, BAc', ABb, and length of link, E.

1. As the length of arm, D, is to the chord of arc, *ab*, divided by 2, so is the radius to the sine angle oscillation of arm, D, divided by 4.

2. 360° is to the whole circumference as the angle *b*B*a* is to the length of arc *ab*.



3. Now arc *ab* is equal to arc *a'c'*.

4. The whole circumference is to 360° as the length of arc *a'c'* is to the angle oscillation of C divided by 2.

5. Half angle oscillation, C, taken from angle BA*a'* is equal to angle BA*c'*.

6. Half angle oscillation, D, taken from angle AB*a* is equal to angle AB*b*.

7. The diagonal of the rectangle formed by the (sum of the sines of the angles of the arms with AB) into (AB—sum of cosines of same) will be the length of link, E.

G. R. NASH, Civil Engineer.

North Adams, Mass.

[We have received other solutions of this problem, but as this covers the ground in a very simple manner, we think it will be sufficient. Those forwarding the solutions not published will accept our thanks and assurances that it is not because they lack merit that they are declined.—EDS.

Reciprocating Parts of Steam Engines.

MESSRS. EDITORS:—In one of the late numbers of your journal, you publish a paper, read by Mr. Porter before some learned society in New York, on something about the possibility or practicability of running a steam engine at a high rate of speed, and claiming to give a scientific explanation of the why and wherefore. Now, scientifically, I know nothing about a steam engine; practically, I know how to stop and start one. Therefore, you will understand that what I say is not as coming from one who claims to be wise above what is written, but as simply being a statement of the case, as it appears to one who wants to learn, and takes this way to draw out the truth. A scientific theory, invested with all its sines, coefficients, and other paraphernalia, is a very pretty thing to look at, no doubt, for those who understand it, and, when properly applied, is invaluable; but when, as in this case, a practical question is to be decided, by the aid of a scientific demonstration, it will not do to throw aside the main elements of the problem, or any, in fact, of the minor points, no matter how trivial they may appear.

Mr. Porter's labors were strictly of a scientific nature. He starts out with the proposition that what he is about to explain is very simple, and very likely it is; but, for one, I can't see it, and I want more light. He says that it takes a certain number of pounds to overcome the inertia of the reciprocating parts of a certain weight, to give it a certain speed. What is inertia? He says, "we will not take into account the friction of parts." Now, my understanding of this point is, that friction is practically one of the main elements in the problem. How can we hope to obtain a correct solution when he rubs out one of the terms of the equation? What is friction doing all the time, while he is theoretically having his reciprocating parts storing up power and then giving it out again, just at the right time, and in the right quantity?

What an immense amount of iron has been wasted by being cast into fly wheels, when a fraction of the amount, if only put into cross heads, would render fly wheels unnecessary!

Mr. Porter stops short in his discussion. He should have added a table giving the proportionate length of stroke, weight of parts, and number of revolutions required to produce the effect of an engine running at a high speed, without the least fraction of inequality in the strain on the crank, and then the sun would have fairly risen in the "dawn of a new era for the steam engine." But, as it is so very simple we can all figure it out for ourselves.

In the diagram Mr. Porter gives, to illustrate the travel of the piston, he wets his finger and draws it over another term in the equation (a method of elimination not taught by Hutton, Davies, and other mathematicians). It is a quick way, but is