TABLE I

STEAM TRACTION ENGINE PRACTICE IN THE UNITED STATES

Showing ratio of stroke to bore, normal engine speed, piston speed and rate of travel of 108 engines of the different sizes built by fifteen leading manufacturers.

Make of Engines.	Average for different sizes of each make.	Ratio of stroke to bore.	Normal Engine speed R.P.H.	Piston speed feet per minute.	Rate of travel miles per hour.
No. 1	6	1.352	257.0	462.0	2.205
No. 2	9	1.190	244.4	402.6	2.313
No. 3	6	1.231	223.3	390.5	....
No. 4	12	1.410	236.6	412.4	2.152
No. 5	7	1.213	251.4	405.9	....
No. 6	12	1.403	247.0	456.3	....
No. 7	2	1.250	220.0	366.0	2.100
No. 8	9	1.373	256.4	474.3	....
No. 9	6	1.363	227.5	441.7	....
No. 10	6	1.285	232.5	406.2	2.170
No. 11	10	1.288	247.5	461.5	....
No. 12	7	1.236	240.7	412.4	....
No. 13	6	1.117	246.7	431.0	2.498
No. 14	5	1.108	240.0	416.0	....
No. 15	5	1.718	238.0	414.2	....
Total	118				
Minnimum		1.00	200	246	1.67
Maximum		2.18	300	557	2.63
Average		1.313	240.6	423.5	2.239

The figures in the columns of the table are obtained by averaging the various sizes of engines built by each of the fifteen manufacturers. The minimum and maximum given at the bottom of each column, however, in each case show the extreme of any one size, while the averages below are the averages of all sizes and all makes represented, and consequently are not necessarily the same as any figure in the column above. These figures are given, not only as illustrating the general practice along certain lines, but also because some of these figures are interesting in connection with the points brought up later on.

There are a few traction engines which differ quite widely from the accepted type, but these have, as a rule, been built for some particular class of work and are not usually conceded to be suitable for general work in various localities. Among these are the Best and Holt engines which are built on the Pacific coast, primarily for hauling combined harvesters, but are also used to some extent for plowing, working the soil and for hauling logs, ore, etc. These engines are quite large, some being rated as high as 110 horse-power. When required, the boilers furnish steam for an auxiliary engine to drive the header and traveling thresher. Although built for similar purposes, these two makes differ considerably in construction, as one has an upright boiler while the other has a horizontal boiler; one has a single engine while the other has a double engine; and one is chain driven while the other is gear driven. Both ordinarily use crude oil for fuel. Both use a single front wheel, have traction wheels of large diameter (seven to nine feet), and have wide tires, widths of four or five feet being common. One of these manufacturers has built special engines with the traction wheel-tires thirteen and even sixteen feet wide.

Another example of an engine built for a special purpose is the Lombard, made in New England. This engine is of the double-under-mounted type with locomotive boiler. In place of the usual traction wheels it has the so called "caterpillar wheels", and in place of the front wheels it has runners. It is used to haul logs on snow or ice roads in the woods and the exhaust of the engine is thrown down on to the road where it freezes and renews the ice, making it unnecessary to sprinkle the road as is done when hauling by horses. The caterpillar wheels consist of an endless steel belt running on two sprocket wheels. The part of this belt or chain in contact with the ground is kept in practically a straight line by rollers on the inside. This arrangement, as already noted, was proposed quite early in the history of the traction engine, and is supposed to have great traction power. Several engines with caterpillar wheels have been built in England and a few in this country.

Walking wheels also have been proposed at various times. These have feet hinged so that they remain flat on the ground while in contact with it.

A discussion of the traction engine at the present time is not possible without some reference to the relative merits of the steam and internal combustion engines, but it is not the purpose of this paper to attempt to show which of the two is more nearly ideal. In such a comparison, all the factors which go to make up the ideal engine as outlined must be taken into account and this is difficult, for the experience of one operator varies widely from that of another. In fact, the personal element of the operator enters so largely into the question that in many cases it is the deciding factor in determining the reliability, the durability, the cost of attendance, the cost of maintenance, and it usually determines to a more or less extent its ability to travel over bad ground or difficult places, its safety and the amount of lubricants required.

The fuel cost is always an important item, except when it is straw