# Brinutific Americam. 

ESTABLISHED 1845
MUNN \& CO.
Editors and Proprietors.
PUBLISHED WEEKLY AT
No. 361 BROADWAY, - - NEW YORK.

TERMS FOR THE SCIENTIFIC AMERICAN Established 1515.)
One copy, one year, for the U. S., Canada or Mexic@.................. $\mathbf{\$ 3 . 1 1 0}$
One copy, six months, for the U. S., Canada or Mexic@.... One copy, oneyeart, tany foreign country, pestageprepaid. $£ 0$ titis. 5 d . 4.00 Remut by post al or express money order, or by bank draft or chech

The scientiflc American Supplemen (Established 1S56)


Bnitding Edition of Scientific American. Established 158.5.)



Export Edition of the scientifle
stablished 187\%


MUNN \& C $\bullet$.. Publishers, 3il Breadway, New York.


NEW YORK, SATURDAY, JANUARY 15, 1898.

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## cylinder ratios in multiple-cylinder steam

 ENGINES.The best ratie of expansion in multiple-cylinder en gines has yet to be determined. At present there is considerable divergence of practice. Each builder is guided by his $\bullet$ wn conclusions, which are based more upen bbservation than upen any scientitic tests. Luce motive builders are awaiting with considerable inter est the results of the experimental work which is to be carried out upon the new locomotive at the labora tory of the Purdue University, which has been fur nished with high and low pressure cylinders, the latte being bushed to enable various ratios of expansion to be tested. A valuable contribution to our knowledg of this subject has been afforded by a series of tests which Prof. Thurston has lately carried out at Sibley College. The experiments were made on an ex perimental triple-expansion engine with cylinders: mehes, 16 inches, and 24 inches diameter, by 36 inch stroke. A compound engine with a cylinder ratio o sure and intermediate cylinders; another compeund with a rati- of 7 te 1 was secured by combining the high pressure and low pressure cylinders; and the engine in its normal condition was used for the triple expansion tests.
Theresults were in some respects surprising, although previous experiments with the Rockwood compound engine had shown similar results. The diagram slow ing steam consumption per indicated horse power proves that at about 37 horse power the steam con sumption was about the same in each case. Above this the 3 to 1 compound showed a minimum stean consumption of 18 pounds per horse power per hour at is horse power. The minimum steam consumptio or the 7 to 1 compound was 15.8 pounds, and fo: the diagrams showing the variation in steam for dyname metric or delivered horse power show that the triple xpansion engine was most economical under loads o from 115 to 120 horse power; but strange to say, the - 1 compound consumed less steam per horse pewe at loads under 85 horse pewer and less steam than a - 1 compound at loads above 72 horse power. Mr. Thurston further proved that the most economical ratie of expansion for the 3 to 1 compound is 12 and 21 for the triple expansion engine. For the 7 to 1 compound the best ratie would probably be about 17 . The conclu sion is drawn that, after making all allowances, the riple shows an economy ever the 7 to 1 compound $\bullet$ ver 1 pound of steam per horse power per hour, and hat a still larger gain is made by the 7 to 1 compound ver the 3 te 1 compound

## ELECTRIC LOCOMOTIVES AT TERMINAL STATIONS

Although the day when the electric will supplant the steam locomotive on trunk lines may be quite re mote, it is steadily encreaching upen its domain in certain branches of locomotive work. The latest evidence of this comes in the shape of an announcement that the handsome Union Depot at Boston is tomak use of electric locometives and that ne steam traction will be used with:n a mile of the station. The stean -comotives will bring their trains up to the electric yard, where they will be picked up and brought in by the electric lecomotives. Outgoing trains will be simi larly handled, being picked up by the steam lecome tives at the limits of the electric yard. The proposed scheme is an excellent one and could be adopted by the existing terminal stations to great advantage. Though it might involve a slight delay and greater cost of eperation, the gain to the traveling public and the locality surrounding the great terminals would b valuable in many ways. The handsome termina structures themselves would be healthier and more cleanly. Any traveler with an eye to the artistic must have noticed how speedily the fresh painted ronwork of such a terminal as the Grand Central Sta tion in New York, or the Pennsylvania Railroad Sta tion in Philadelphia, is begrimed by the gases from the locomotives. With the substitution of electricity the handsome train shed reofs would preserve their proper coloring and the light, graceful effect of their irenwork indefinitely. In the yards, moreover, the risy exhaust of the switching engines would give way - the quiet hum of the motor-a change devoutly to be wished by the residents of the adjoining districts, who would at the same time be rid of the smoke and ashes that add their quotat the general inconvenience. When the appreach to the terminal is in tunnel, as in many of the European cities and here on Manhattan Island, the purifying of the atmesphere due to such a change is toe ebvious for cemment.
Before leaving this subject. it should be noted that an electric switching locomotive has this week made a successful trial on the H•boken Shore Read, New Jer sey. It has been built for hauling heavily loaded freight trains between the railread terminals and the wharves of the transatlantic liners at Hoboken. The locmotive, which is eight-wheeled, develops a total horse pewer of 540 on tour axles, each motor being e 135 horse power. The substitution of electric for steam
trict affected by it

## FORETHOUGHT IN THE CONSTRUCTION OF DRYDOCKS

The figures which have been given out respecting the new additions, costing $\$ 5,000,000$, which are to be made - the dock system of Liverpeol are very significant The most striking feature is a new drydeck which is to be 920 feet long, with an entrance 94 feet wide. Othe outeuplated imprevements, whose total cost will be $10.500,000$ include the enlargement of a dock which $\$ 10.500,000$, include the enlargement of a dock which is ction of the whill be ruction of two others which will be respectively 620 nd 630 feet in length. It is probable that, before de ermining the length of the new docks, the authoritie onsulted the owners of the transatlantic steamship ines which run to Liverpeel, and that these vast dec hmensions have been determined by the great size o he ships which these companies have in prospect The time is drawing near when the public will be look g for an answer on the part of the Cunard Company - the "Kaiser Wilhelm der Gresse" and the "Oceanic," nd it would n॰t be surprising if their next pair of ships had a deck length of frem 725 te 750 feet. It is inter sting to note in this connection that the new Live ooll dock could accommedate the White Star line Oceanic," 704 feet in length, with 216 feet to spare.

## AROUND THE WORLD IN TWENTY-EIGHT DAYS

When Jules Verne wrote his fascinating book,
Around the World in Eighty Days," he set a mark which the public has evidently agreed to use in noting any advance in the speed of circumnavigating the vorld. The writer aimel to show the very utmos that could be accomplished by the means of trans portation of his day, and at the time the book came out it had all the pessibility and imprebability which characterized the other works of the author. In les than a quarter of a century, however, the feat of tour ing the world in eighty days has not only passed ou f the relu of fiction int for for arselves within few yer the ary tourist can make the trip in less than half o ighty days. This will be possible just as seon as the Trans-Siberian railread is completed, or early in the wentieth century.
The Russian minister of communication, M. Chilkev as stated that when the great railread is opened the our of the world can be completed in thirty-thre days, the various divisions of the journey being cov ered as follows

| Bremen to St. Petersburg. | 13/2 days |  |
| :---: | :---: | :---: |
| St. Petersburg to Vladivostok |  |  |
| Vladivostok to San Francisco |  | " |
| San Francisc® to New Yerk. | 4128 | ' |
| New York to Bremen. |  | " |

$$
\mathrm{T} \bullet \mathrm{t}
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Totar.
These figures are evidently based upen tine actua unning speeds of the varieus transpertation lines, and an estimated speed of about 25 miles an hour from $\mathbf{S}$ Petersburar te Vladivestok.
There is ne doubt that even this time could be greatly reduced if the speed of the trains, and to a less extent f the ships, were not kept d•wn by considerations o econemy
If any one were to set out to complete the circuit of the globe in the least possible time that moderi transpertation, in the shape of existing ships and ailways is capable of irrespective of cest it would b ossible to reduce the estimate of $M$. Chilker by five lays at least.
In the figures given below it is assumed that the trav eler has the services of the fastest existing ships on the cean, and that the trains are run at the highest rat of speed consistent with the gradients, curvature and condition of the readbed. in the various district passed ever. Thus the "Kaiser Wilhelm" would b available for the Atlantic passage, with her speed of 22.34 knots per hour, and a 20 kn t ship is assumed for the Pacific passage. T• maintain the high averages of he special trains chartered on the railreads, it is as sumed that speeds of from 60 te 70 miles an hour would be maintained on the plains to compensate for time ost in crossing the mountain divides. What can b done with special facilities is shown by the fast run which are frequently made in this country and in Engrand.
The probable best time that could be made by hartering special trains would be about as follows

| Route. | $\stackrel{\text { Miles }}{\text { or Knots. }}$ | $\begin{gathered} \text { Speed } \\ \text { per Hour. } \end{gathered}$ | $\begin{aligned} & \text { Th Time } \begin{array}{l} \text { Tours } \end{array} \end{aligned}$ |
| :---: | :---: | :---: | :---: |
| New York to Plymoutn... | 2.990 | $22 \cdot 35$ knoty. | 133.8 |
| Plymouth to London. | 194 | 60 miles. | 3.2 |
| London to Moscow | 1,800 | 50 " | 38.0 |
| Moscorv to Tcheliabinsk.. | 1,100 | 40 | 27.5 |
| Tcheliabinsk to Vladivostok. | 4,500 | 37 | 121.6 |
| Vladivostok to San Francisco. | 5,400 | 20 knots. | 2700 |
| San Francisco to Omaha. | 1,864 | 40 miles. | 46.6 |
| Omaha to Chicajo... | 493 |  | $9 \cdot 9$ |
| Cbicago to New York . | 998 | io " | 16.6 |

This gives a total of 27 days 17 hours for the whol
ourney. If $\mathbf{7}$ hours be allowed for delay in transfer

