Correspondence.

Locomotive Boiler Explosion.

To the Editor of the SCIENTIFIC AMERICAN:

I would suggest, in connection with the locomotive boiler explosion described in the June 23 issue of the SCIENTIFIC AMERICAN, that imperfect methods of designing and calculating the strength of the longitudinal seams are responsible for many explosions similar to this one. The effects of eccentric loading, elasticity, and fatigue are entirely neglected. In the ordinary lap joint the maximum stresses, due to the fact that the plates are not in line, are four times as great as they are assumed to be. Consequently, they are considerably above the elastic limit. The strength of these joints, as determined by tests of new specimens, is thought to confirm the customary calculations, but the new specimens possess elasticity, allowing a redistribution of the stress, while long use has deprived the old boiler plates of this quality. Of course, the repeated stress in excess of the elastic limit, even though it is less than the ultimate strength of the plate, will in time produce failure. The inside covering strip is offset over the edge of the plate. When a rigid construction and an elastic one are used simultaneously to support a load, most of the weight is carried by the rigid one. With its offset, the covering strip cannot have sufficient rigidity to be of much support for the joint. Only butt joints with covering strips inside and outside are suitable for any but the lightest service. The eccentricity of loading should always be considered in designing lap joints, and the usefulness of covering strips in connection with lap joints is very uncertain. G. E.

The Hot-Air Boiler.

To the Editor of the SCIENTIFIC AMERICAN:

In the SCIENTIFIC AMERICAN for June 16, 1906, there was an article upon hot-air boilers, in the course of which the Editor said:

"The basic idea upon which these generators are built is by no means new. Propositions for the construction and use of such generators, usually for stationary power plants, have formed the subject of a number of patents, and have occasionally appeared in the columns of the technical press; but notwithstanding this, the idea would seem to be little known, and so far as the writer is aware, the method has not yet been practically applied to either road or marine locomotion. This is probably on account of difficulties which arise from defects in the compressed-air and fuel-regulating devices. It seems evident, however, that the system is capable of successful development, and promises advantages of such a nature as to merit further consideration."

It so happens that I can supply a few facts upon this subject, which are subjoined; about 1853 or 1854 an experiment with an apparatus similar to that described in the aforesaid article from the SCIENTIFIC AMERICAN was tried at the Boardman-Holbrook (I am not certain of the exact title of the firm) Iron Works, then at the foot of Eighth Street, New York, but since destroyed, upon a considerable scale; a steamboat about 150 feet long was built and fitted with a beam engine of about 200 horse-power and a peculiar boiler. As I now recall it, chiefly from personal observation, it was intended to operate by compressed air forced directly into the furnace, having a very short, inadequate stack. After steam had been generated at a certain pressure, communication with the steam space was opened, and the products of combustion, gases, etc., were forced directly into the steam space, and thereafter used in the cylinder of the main engine. I recall clearly the operation of this experiment, as I sat on the dock directly over the boat in question, having "played hookey" from the shop—the old Morgan Iron Works—where I was employed as an apprentice. There was a great rumbling and uproar in the firerooms, accompanied by an all-pervading odor of gas, but nothing happened of a serious nature, and after awhile the engine began to turn over. Beginning to fear a reprimand from the foreman for "absence without leave," I returned to my own shop, but continued to visit the queer steamboat as occasion offered thereafter. The compressed-air boiler was experimented with for a few days, and then the lines were cast off and she went out into the river, where she maneuvered for a short distance, but soon returned to her dock, as it seemed to me for want of steam, which was afterward proved to be the fact. There is no question, however, but that the vessel was actually moved under way by this system, and it might have proved successful if the experimenters had been able to overcome the difficulties arising from the cinders and dirt carried into the steam space, to such an extent that the valve faces were practically destroyed in a short time. They also lacked knowledge of the physical difficulties involved in the use of mingled coal gas and steam; in a word, they were years ahead of their problem.

Nevertheless, their first failure did not deter them from trying another experiment, this time with a locomotive, which was built in the old Novelty Iron Works, when Horatio Allen was at the head of it. Presumably, this trial had the benefit of Mr. Allen's experience, but "one event happened to this experiment also"—total failure. The locomotive was taken over to the Erie Railroad, and there tried, but in a short time the smoke-box filled up with cinders and the boiler became inoperative.

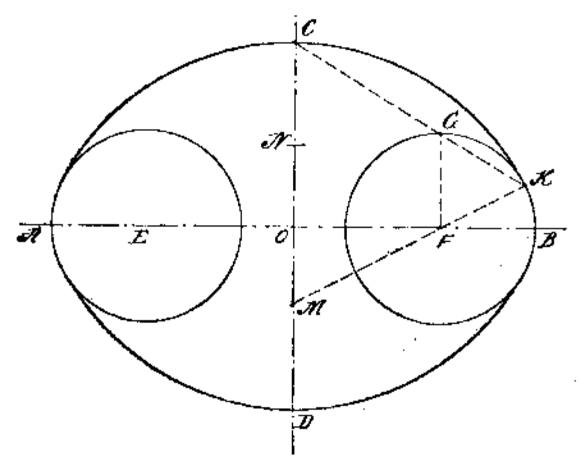
I have endeavored to get more details of this experiment with a hot-air boiler, but alas! all who were likely to have had knowledge of it have passed away. The only engineer still living who may recall the events related is Mr. Thomas F. Rowland, of the Continental Iron Works, Greenpoint, Long Island. Mr. Rowland was in the Morgan Iron Works at the time, and may have some knowledge of this experiment of fifty-odd years ago. EGBERT P. WATSON.

Elizabeth, N. J.

How to Draw an Ellipse.

To the Editor of the SCIENTIFIC AMERICAN:

In your recently published "Scientific American Reference Book" I find several methods given for drawing an ellipse. Of these, the one with the string seems



the easiest; but it is difficult to make an endless string exactly equal to the three sides of the triangle, and again the knot in the string interferes with the correct drawing of the figure. Of the methods given for drawing an ellipse with a pair of compasses, the one headed No. 51 is the easiest, but is applicable to only one kind of ellipse in which the two axes bear a certain fixed ratio to each other. The other methods are very cumbersome, as we have to proceed slowly from point to point. I give below my method, by which an ellipse can be described in a very short time by means of a pair of compasses, whatever be the proportion between the two axes:

Let AB be the major axis and CD the minor axis, intersecting at O.

From A and B measure AE and BF, each equal to half of CO.

From F and E as centers and with radii EA and FB describe circles.

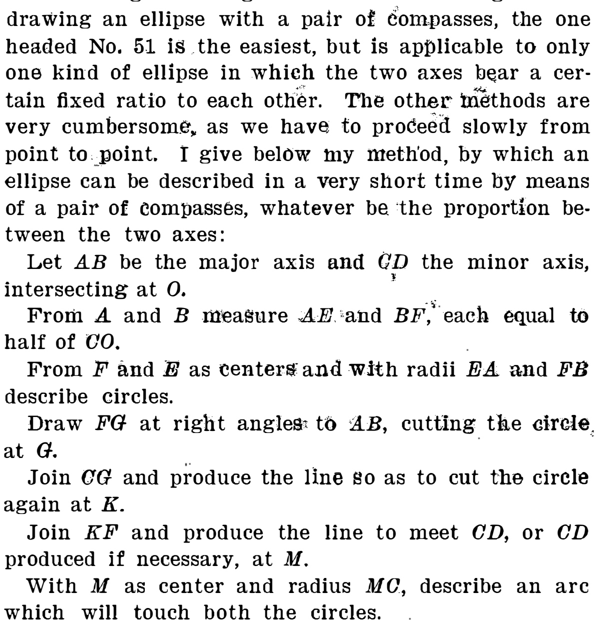
Draw FG at right angles to AB, cutting the circle at G.

Join CG and produce the line so as to cut the circle again at K.

Join KF and produce the line to meet CD, or CD produced if necessary, at M.

With M as center and radius MC, describe an arc which will touch both the circles.

In the same way the arc may be described on the



opposite side with N as center and ND radius, ND being equal to MC.

Then $ACBD$ is the ellipse required.

I am, however, unable to prove that the figure is an ellipse; can any of your readers supply the proof?

There is one great defect in this method, which is that when there is very great disproportion in the size of the two axes, it is necessary to employ a very large pair of compasses such as cannot be readily obtained anywhere. Can your readers improve upon the above method and show a way of drawing an ellipse easily even when the major axis is very much greater than the minor? M. N. KUKA.

Bombay, April 19, 1906.

The Salisbury Railway Accident.

One of the most appalling accidents on record in the annals of English railroading occurred early Sunday morning, July 1, when an express train of the London and South-Western Railway jumped the track at Salisbury, between Plymouth and London, and was shattered into a tangled mass of wreckage against the side of a bridge spanning a roadway. Of the passengers, twenty-three were killed outright and many others crushed and maimed, while four members of the train crew also lost their lives in the accident.

This, the most recent railroad horror in England, appears to indicate that even the admittedly excellent British transportation systems are not free from the taint of speed mania, and that despite close supervision and safeguarding of the traveler's interests the rivalry between the various companies is apt to result in those attempts at record-breaking which have so frequently been attended with disastrous results in this country. The accident in question is particularly brought home to us on this side of the Atlantic because of the sad fact that nearly all who lost their lives in the train crash were American tourists. The train was the so-called American Line Express, from Plymouth to London, on the London & Southwestern Railway, which carried the passengers from the American Line steamship "New York." The true cause of the accident is not as yet apparent; the inquiry, however, will probably show that it was due to the high rate of speed at which the train was traveling upon a section of road not peculiarly well fitted for such travel. It has been stated, too, that the train was too light for high speed. It appears that it was moving at the rate of sixty miles an hour, as the engine driver was apparently attempting to lower the record, or at least to approach it, for the journey from Plymouth to London. While swinging around a very sharp curve at Salisbury the engine suddenly left the rails, crashed through a milk train on a neighboring track, and was shattered into a tangled mass of wreckage against the iron girder of the bridge, after destroying a locomotive standing on another track. The engine driver seems to have made no attempt to save his own life, for his charred body was found hours afterward in the wreckage of the locomotive cab. From statements of survivors, it appears that the swaying and jolting of the cars as the speed increased had become noticeable, and even alarming, shortly before the locomotive left the rails. While this may indicate that the roadbed, for at least that section of the track, is not in the excellent condition usual with English railroads, it is doubtful whether this was really the cause of the accident. More probably the high speed, in conjunction with the sharp curvature of the track at Salisbury, gave rise to the ensuing accident.

It is said that the section of the line in the neighborhood of Salisbury has been known to be dangerous, and that the engine drivers have had orders not to exceed a speed of 30 miles an hour at that point. It is to be hoped that this disobedience of orders is not an indication that the English railroads are beginning to resemble certain of our American lines in the desire for speed almost irrespective of the attendant risks. Within recent months there has been a series of accidents on British railroads which would tend to show that such is the case, and we trust that the terrible lesson which these disasters are adapted to teach will not be neglected in establishing a new record for safe travel in England such as that which British railroads have deservedly possessed heretofore.

Official Meteorological Summary, New York, N. Y., June, 1906.

Atmospheric pressure: Highest, 30.34; date, 13th; lowest, 29.71; date, 6th; mean, 29.94. Temperature: Highest, 93; date, 30th; lowest, 52; date, 12th; mean of warmest day, 82; date, 30th; coldest day, 62; date, 12th; mean of maximum for the month, 79.5; mean of minimum, 63.5; absolute mean, 71.5; normal, 69; average daily excess compared with mean of 36 years, +2.5. *Warmest mean temperature for June, 72, in 1888, 1892, and 1899; coldest mean for June, 64, in 1903. Absolute maximum and minimum for this month for 36 years, 97, and 47. Precipitation: 1.70; greatest in 24 hours, 0.48; date, 29th; average for this month for 36 years, 3.25; deficiency, —1.55; greatest precipitation, 7.70, in 1887, least, 0.86, in 1894. Wind: Prevailing direction, south; total movement, 6,855 miles; average hourly velocity, 9.5 miles; maximum velocity, 54 miles per hour. Weather: Clear days, 5; partly cloudy, 17; cloudy, 8. Thunderstorms, date, 2d, 6th, 9th, 10th, 21st, 23d, 29th, 30th. Frost: Light.

* Mean temperature of June for the three years named is given in round numbers.