over the interchange rules of the past decade, they were to be at last settled by the simple process of cutting the Gordian knot.

THE ANNUAL MEETING OF THE MECHANICAL ENGINEERS.

THE proceedings of the annual meetings of the American Society of Mechanical Engineers and other kindred associations have now become so voluminous that it is impossible for a monthly publication like the AMERICAN ENGINEER to give even an intelligible abstract of the papers and discussions. All that can be done is to publish such papers as have special value, and, by way of comment, refer to others which shed any new light on questions which are of interest to us and our readers.

On another page the admirable paper by Professor Goss, with the title An Experimental Study of the Effect of the Counterbalance in Locomotive Driving-Wheels upon the Pressure between Wheel and Rail, is reprinted, with the discussion thereon. The latter, in which the writer took a part, will perhaps make any further comment here superfluous. There is an undoubted tendency among reformers to exaggerate evils which they undertake to reform. In that paper it was shown that the rear or trailing wheels of the experimental locomotive at the Perdue University, where the investigations were made, and which had 54.2 per cent. of excess of counterbalance, as determined by an average of five rules "in common use," lifted entirely clear of the rail at a speed of 58.3 miles per hour. The main driving-wheel, which had an excess of only 4 per cent., did not rise clear of the rail, and, from the diagrams in fig. 4, it would appear that the wire which was run under the wheels whose original diameter was 0.037 in. and the compression of which recorded the downward pressure of the wheels, was reduced at the point of minimum pressure to about 0.2375 in., showing that there was considerable downward pressure even at that point. This wheel had a total counterbalance of 550.2 lbs. It would be interesting to know to what extent the thickness of the wire would have been affected if the wheel had been counterbalanced by Rule B, referred to in the paper, which would have made the weight only 462 lbs. Locomotive engineers would like to know what the variation of pressure on the rail is when a locomotive is counterbalanced by any of the rules which give good results in practice. As was pointed out in the discussion, all that the paper proves is that an *excess* of counterbalance produces some bad effects which may be dangerous. This may be a good reason for being very careful that locomotives have not an excess of balance weights, but hardly justifies sensational statements of the injurious effects of such weights when they are most advantageously proportioned. There can be no doubt, though, of the fact that even in the latter case counterbalance weights produce very serious disturbances in locomotives when they are working at high speeds, and that it is very desirable to eliminate these disturbances if we can do so without incurring other evils more serious than the effects of such weights. The most successful effort which has thus far been made to do this is that of M. Baudry, Chief Engineer of Traction of the Paris, Lyons & Mediterranean Railway, one of whose engines was illustrated in the RAILROAD AND ENGINEERING JOURNAL of November, 1892, page 499, and again in the AMERICAN ENGINEER of June, 1893, pages 296–299, and in this number on page 31. A similar engine for the Northern Railway of France was illustrated in March, 1893, and one of them was exhibited at the Chicago Exhibition in the same year, and which did not seem to attract the attention from American engineers which its merits deserved. Mr. George S. Strong has designed an engine on similar lines, and efforts are now being made to introduce it in this country.

The French locomotives referred to are of the compound type, with four cylinders, four driving-wheels and a four-wheeled truck. The small or high-pressure cylinders are outside and connected to the rear or trailing pair of drivers. The large or low-pressure cylinders are inside the frames, and are connected to a cranked axle to which the forward or main driving-wheels are attached. The two cranks on each side of the engine are opposite to and balance each other. The two pairs of wheels are connected together by coupling-rods. From this description it will be seen that the rear or trailing pair of wheels are driven by the high-pressure cylinders, and the front pair by the low-pressure cylinders. Consequently each pair of these does only half the amount of work which the cylinders of a simple engine must do, and the only function of the coupling-rods is to hold the two pairs of wheels in their proper relative positions. Consequently all the parts may be and were made very light. Of course there is considerable duplication of parts, and there is the cranked axle and inside cylinders, which are great bugbears to Americans. The evil of the former, it is believed, however, is exaggerated here, and is not as great now, with the improved materials and methods of manufacture of the present day, as it was 40 years ago, the experience of which time with such axles some of us old fellows still remember. The evils of inside cylinders are also lessened by placing the valve-seats vertically and on the outer sides of the cylinders. This permits the steam-chests and their covers to be removed from the outside, and also makes the valve gear accessible, the high-pressure or outside cylinders being attached farther back on the frames than the low-pressure ones are, which permits of access to the valve faces of the latter from the outside.

Mr. Strong has worked in somewhat the same direction, but he connects both pairs of cylinders to the front driving-axle. Now, it seems as though, from a purely mechanical standpoint, that these are the most perfect forms of locomotives that have yet been designed. Whatever advantage there is in compounding ought to be realized in an engine of this type; and by locating the two cranks on each side opposite to each other the reciprocating parts of the one will balance those of the other. It is necessary, then, to balance only the revolving parts, which presents no difficulties.

It is to be hoped that Professor Goss will tell us, however, just what the effects of counterbalances are when they are proportioned in the most approved way, and indicate the consequent evils. It will then be a question for consideration whether these evils are greater or less than those of duplicate cylinders and their connections, and duplicate valve gear, a cranked axle and inside cylinders. Of course the French or the Strong engine must be credited with the saving due to the compound system if they are compared with simple engines; but there would be no such credit if they are compared with a two-cylinder compound locomotive. It is to be hoped that either Mr. Strong's or Mr. Baudry's locomotive will be tried under fair auspices in this country.

Besides Professor Goss's paper, there were some others which were interesting to railroad men. Mr. David L. Barnes presented one on Rail Pressures of Locomotive Driving-Wheels. This, with Professor Webb's appendix, which gives an Analysis of Path of Centre of Gravity of Driving-Wheel, fills 56 pages. The impression left after reading Mr. Barnes' paper is that the subject which he has discussed is a very complex one, and that he is very uncertain about his conclusions. Professor Webb's analysis to the ordinary reader appears like a sort of transcendental discussion of the subject, to be understanded only by those who can sustain mental existence in an ether of pure mathematics, and do not require an ordinary atmosphere for their intellectual sustentation. We have not been able to draw many practical deductions from either, although perhaps a more profound study of each might reveal their esoteric meaning.