450. A Mathematical Recreation
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their lines of action meeting in D, outside ABC, and let a triangle HKL be drawn with its sides KL, LH, HK parallel to the lines of action of P, Q, R. Then, if KO, HO be drawn parallel to AC, BC, LO will be parallel to AB. Now let HK be taken the same length as CD, and let the figure $HKLO$ be applied to $ABCD$ on the opposite side of CD, so that these two equal lines coincide, and we get *E. T.* 9681. This theorem has already been deduced statically in this manner, and shown to be a special case of Pascal's Theorem by Mr. P. J. Heawood in Note 75, when it is obtained from the consideration of a quadrilateral in equilibrium under forces along its sides, and a reference is made in Note 81 (*Elementary Geometrical Statics* by Mr. W. J. Dobbs, pp. 185-193). Prof. Crofton in his *Elements of Applied Mechanics*, after quoting Rankine's theorem and giving a statical proof, points out that it may be stated in the following *purely* geometrical form, and proved by pure geometry. If any three straight lines through the angles of a triangle ABC meet in a point D, and any other triangle HKL have its sides KL, LH, HK parallel to those three lines AD, BD, CD, then, if through H, K, L lines be drawn parallel to BC, CA, AB, they will meet in a point. E. M. LANGLEY.

449. [I. 24. a.] *Note on approximate value of* π.

Let AOB be the diameter of a given circle, centre O. Produce OB to E so that $OB=BE$. Then, if P is a point on the circumference of the circle fairly near to A, and EP produced meets the tangent at A in Q, the arc $AP=AQ$. This follows from the formula of Snellius, $\theta=3\sin\theta/(2\theta)$.

Taking $AOP=\pi/6$, and assuming that $\sin\pi/6=1/2$ and $\cos\pi/6=\sqrt{3}/2$ ($\sqrt{3}=19/11$), we have $\pi=6\times 3/2\times 22/63=22/7$. R. F. DAVIS.

450. [X. 10.] *A Mathematical Recreation.*

I saw recently a card trick which, on analysis, rested on the proposition enunciated below. I do not know if it has been previously published, but it was new to me. Here is the proposition:

Remove from an ordinary pack of cards the court cards. Arrange the remaining 40 cards, faces upwards, in suits, in four lines thus: In the first line, the 1, 2, ... 10 of suit A; in the second line, the 10, 1, 2, ... 9 of suit B; in the third line, the 9, 10, 1, ... 8 of suit C; in the last line, the 8, 9, 10, 1, ... 7 of suit D. Next take up the first card of line 1, put below it the first card of line 2, put below that the first card of line 3, and put below that the first card of line 4. Turn this pile of four cards face downwards. Take up the four cards in the second column in the same way, turn them face downwards, and put them below the first pile of four cards. Continue this process until all the cards are taken up. Ask someone to mention any card. Suppose the number of pips on it is n. Then if it is of suit A, it will be the $4n$th card in the pack. If it is of suit B, it will be the $(4n+3)$th card in the pack. If it is of suit C, it will be the $(4n+6)$th card in the pack. If it is of suit D, it will be the $(4n+9)$th card in the pack. Hence by counting the cards in the pack, cyclically if necessary, the card desired can be turned up at the proper number. Any one with a liking for such recreations can alter the form of presentation in various ways, and a full pack can be used if desired.

W. W. ROUSE BALL.

REVIEWS.

The Theory of Proportion. By M. J. M. HILL. Pp. xx + 108. 8s. 6d. net. 1915. (Constable & Co.)

This treatise will be read with great interest and profit, because the author has not only taught the subject for a number of years, but has devoted a great deal of time and labour to the task of putting the theory in a form at once strict and intelligible. In this he has attained a marked success, and