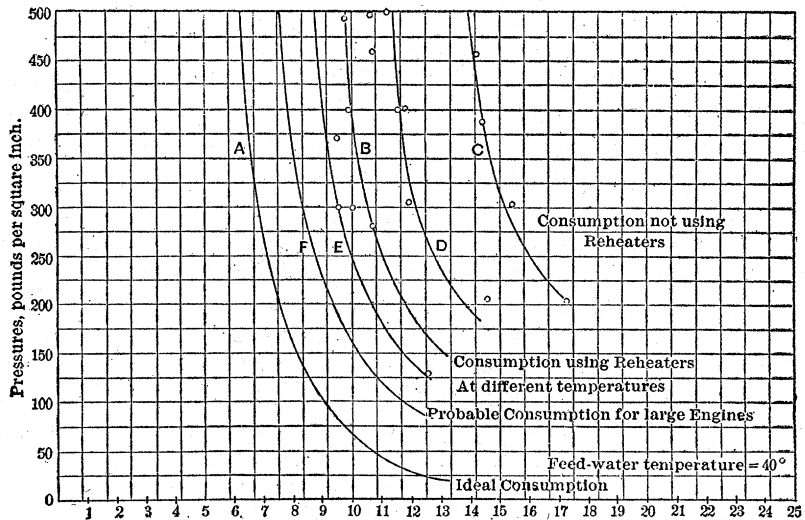

— Efficiency Curves, Ideal and Actual.

where the value of a varies from 18 on the line A, to 25 on B, 30 on C, and to 22 and 24 on lines F and E; w being weight of steam per h. p. per hour, p steam pressure.

Of the figures representing efficiency, as here recorded, it is probable that those on the line C may be accepted as accurate. Those obtained with reheaters in use are obviously less certain, and may be subject to some error. On the whole, the writer considers that the assignment of the lines E and F as those to be attributed to successful practice with large engines, and as representing the 'promise and potency' of high-pressure steam, is well justified.

R. H. Thurston.

Cornell University.

THE ORIGIN OF THE TEETH OF THE MAMMALIA.

Professor H. G. Seeley, F.R.S., in a series of memoirs in the *Philosophical Transactions*, during the past three or four years, has been describing the Upper Triassic vertebrates of South Africa. Certain of these animals are upon the border line between the Reptiles and Mammals, and, as Professor Seeley points out, show a most remarkable intermingling of characters. The cranial characters, with the exception of the paired occipital condyle, are mainly reptilian; the dental characters, and this is the point to which I wish to especially draw attention, are pro-mammalian. The point of particular interest is that within this group are found *all the primitive mammalian types of teeth. Lycosaurus* is haplodont; *Galesaurus Cynognathus*, both members of the *Cynodontia* or Carnivorous division, are *triconodont.* The teeth are as clearly divided into incisors, canines, premolars and molars as those of the lower Jurassic mammals. The dental formula approximates that of the stem mammal. These animals parallel or are actually related to the great 'protodont-triconodont-trituberculate' phylum of mammalia, which includes the Marsupials and Placentals. In a distinct division of herbivorous reptiles, which Seeley terms the *Gomphodontia*, we find a corresponding parallel or ancestral relation to the 'multituberculate' phylum of mammals, including the Multituberculata and possibly the Monotremata. Here, in fact, actually belongs *Tritylodon*, which upon good grounds has, until recently, been considered a multitu-

berculate mammal. The teeth of *Diademadon* show an incipient division of the fang and closely resemble in the crown the alleged *Microlestes* of the Rhætic of Germany. The point of additional interest is in the superior molars of an allied form, *Gomphognathus*. These are, as Professor Seeley implies, multitubercular, but they are also *tritubercular* in pattern. It is difficult to resist the inference that the four upper cusps do not represent the protocone, paracone, metacone and hypocone. If this is supported by further discoveries it will amply demonstrate the truth of the hypothesis which I have long advocated, that multitubercular teeth are more or less degenerate derivatives of tritubercular teeth.

HENRY F. OSBORN.

MARCH 25TH.

ZOOLOGICAL NOTES.

THE SHARP-TAILED FINCHES OF MAINE.

IN the proceedings of the Portland Society of Natural History (Vol. II., March 15, 1897) Mr. A. H. Norton remarks on the distribution and relationship of the sharp-tailed finches of Maine.

He states that *Ammodramus c. subvirgatus* breeds in the swale-bordered tide rivers, in close proximity to rocky bluffs fringed with black spruce, while true *caudacutus* of southwestern Maine rears its young in the broad salt marshes along the sandy beaches. As there are none of these low marshes in the area inhabited by *subvirgatus*, it necessarily takes the only available nesting grounds; consequently the difference in the character of the home of the two birds is of no apparent significance. It is suggested that after the close of the glacial epoch *subvirgatus* followed up the receding ice until a barrier to the bird's northward migration was reached at the Gulf of St. Lawrence. From this point the overflow of individuals pressed westward along the Great Lakes and finally covered the area now occupied by *nelsoni*.

The author, in common with a few others, is of the opinion that *A. caudacutus* and *A. nelsoni* are specifically distinct, and that *subvirgatus* is a race of the later so-called species. In this we do not agree, and would consider it just as logical to separate *Melospiza fasciata* and *M. fallax* into species with *montana* as a race of the latter bird.

A. K. FISHER.

CURRENT NOTES ON PHYSIOGRAPHY.

YELLOWSTONE NATIONAL PARK.

THE Yellowstone folio of the Geologic Atlas, by Hague, Weed and Iddings, forms No. 30 of the series. It has six pages of text, three plates with eleven admirably reproduced photographs, four topographic and four geologic sheets; all at a cost of 75 cents. Apart from the wonders of the geysers, the plateaus of lava beds and volcanic breccias, deeply dissected, especially in the Absaroka range, along the eastern border of the Park, are most notable. The slender, digitate forms of some of the ancient plateau remnants are remarkably well displayed on the topographic sheets. The continental divides in two open valleys that trench across Two-ocean plateau are peculiar, one of them being the famous Two-ocean pass, where a stream from the north forms a fan at the summit of the pass, turning its water rather indifferently to Atlantic Creek on the east or to Pacific Creek on the west. The origin of this deep and rather wide valley through the plateau is not stated, and our curiosity is left unsatisfied as to the reason why the Yellowstone River, with its relatively mature and open headwater valleys, has cut a distinctly young, steep-sided canyon in its more northern course.

BEARPAW MOUNTAINS, MONTANA.

MESSRS. Weed and Pirsson describe the Bearpaw mountains of Montana (Amer. Journ. Science, I., 1896, 283–301, 351–362)