be of the automatic shaking type, so as to prevent the formation of clinkers and facilitate the dropping of the ash. Some form of air control is quite important. Almost any form of stoker or grate under hard service needs a high chimney. The great difficulty in many of our establishments is that the chimney is not high enough and the draught not powerful enough. There should be a margin, and the fireman should have the means of controlling it. If there is not enough draught, the fireman cannot do anything; if there is too much he can easily reduce it. It is impossible to get good results with a small grate. A grate which is large enough under ordinary conditions is not large enough under sudden emergencies. In order that a stoker may commend itself to a purchaser, it should be easily accessible for cleaning and repairing, and it should be so located that it can be taken out and replaced without tearing out the whole front of the boiler. This is one of the serious objections to several forms of stokers which otherwise are very desirable. Where the feed water is pure, the water grate is a success, and where the feed water is impure, the water grate is not a success. Among the requirements in smoke prevention no item is of such importance as good firing. A good fireman can, with an ordinary grate, give good economy, and to a large extent prevent the formation of the smoke, if the boiler is not forced beyond its capacity. A good fireman is just as necessary with any form of stoker that has ever been used. The reason why so many chimneys smoke, is partly because there is not enough fireman, and also because there is not enough boiler.

It has been claimed by opponents to mechanical stokers, or to any form of furnace which is intended to prevent the formation of smoke, that it is impossible to realize the full duty of a boiler when equipped with such a device. I know from my own experience that that is not true. I have made experiments with one form of stoker, and continued them for several years. I found it entirely feasible to double the rated capacity of the ordinary return tubular boiler without the formation of smoke. Of course, when the fire is being cleaned, there is a little smoke. But during ordinary combustion there is no smoke except the blue smoke, which is due to impurities. It is possible to double the ordinary rating of the boiler without smoke, with an ordinary mechanical stoker, and to expect more than this is unreasonable. With hand firing you cannot go beyond this without making smoke, and without limiting the life of the boiler. It has been found by repeated experiments that such attempts are made at the expense of the boiler.

Summing up, then, I will say the principal requirements for the prevention of smoke are the adoption of a device which shall best be adapted to the particular situation; second, a chimney of suitable size and height; third, a boiler, which is at least half as big as it ought to be; and last but not least, a fireman who is worth more than $1.50 a day.

## M'GILL ADVANCES.

Some new appointments have been made in the Faculty of Applied Science, at McGill University, which will add not a little to the strength and efficiency of the scientific section of the University. They are those of Stewart Henbest Capper, as McDonald Professor of Architecture: John Bonsall Porter, Ph.D., as McDonald Professor of Mining and Metallurgy; Herbert W. Umney, as Assistant Professor of Civil Engineering, and Henry F. Armstrong, as Assistant Professor of Descriptive Geometry and Freehand Drawing.

### STEWART HENBEST CAPPER.

S. H. Capper, M.A., who has been appointed to the recently endowed McDonald Chair of Architecture, was educated at the Royal High School of Edinburgh, and in his final year was Dux of the school. In 1875 he entered the University of Edinburgh, passed through the complete Arts Course, and in 1880 graduated as Master of Arts with first-class honors in classical literature, obtaining the Pitt Club Scholarship in Classics. From 1879 to 1884, Mr. Capper resided in Portugal and Spain, as a member of the household of Sir Robert Morier, G.C.B., G.C.M.G., and spent much time in studying the architecture of these countries. In 1884 he became a student of the Ecole des Beaux Arts, and entered the studio of Monsieur J. L. Pascal, architect, member of the Institute of France. He also travelled for study in France and Italy, and in 1887 entered upon the work of practical architecture in Edinburgh. During the last ten years Professor Capper has carried out numerous works, among which may be mentioned: Whitewich Orphanage, Glasgow; University Hall Buildings, Edinburgh; New Laboratories for the Royal College of Physicians, Edinburgh; Model Workmen's Dwellings, Blainhoyle, Perthshire, etc., etc. Mr. Capper is an associate of the Royal Institute of British Architects. In 1891 he was appointed a University extension lecturer in connection with Edinburgh University, and in 1895 he was authorized by the University Court and Senatus Academicus to give a special course of lectures upon architecture. In 1896 he was elected an additional examiner in Archæology and Art for the M.A. degree. He has given numerous courses of lectures upon historical and technical architecture, has a thorough knowledge of French, sufficient, indeed, to lecture in that language, is well acquainted with German and Spanish, and has also a knowledge of Italian. He possesses tact, courtesy and high mindedness; he is both by temperament and habit an educationalist, and has the art of attracting the respect and affection of his students by the firmness and moral strength of his character as well as by his winning address. It need only be added that Mr. Capper's testimonials are of the very highest character, and are from such distinguished authorities as Professor Baldwin Brown, Sir Nathaniel Barnaby, Monsieur J. L. Pascal, Professar Carey Foster, Senor Don Manuel B. Scissio, Ph.D., and many others.

### JOHN BONSALL PORTER, PH.D.

Dr. Porter belongs to an old Massachusetts family, and by his education and experience is eminently qualified for the work connected with the McDonald Chair of Mining and Metallurgy. After a very thorough preliminary training, he took the mining and metallurgic course in the School of Mines, of Columbia University, New York. After graduating, he spent two years in the field study of the economic geology, and mining and metallurgical possibilities of certain of the Southern States. For his investigations during this period he received from Columbia the degree of Doctor of Philosophy in 1884. Dr. Porter was then requested to establish a department of mining and metallurgy in the University of Cincinnati. His work was most successful, and he gradually built up a practical laboratory for milling and metallurgical investigations. After an experience of four years in the University, he entered