In this manner he obtained the formula $\frac{wl^2}{50}$ for bending moment in the mushroom system. His corresponding formula for deflection is $\frac{1}{7000} \cdot \frac{wl^4}{\Sigma Ad^2}$ where

A = the area of one reinforcing rod.
d = the depth of the slab to steel.
l = the span.
w = the total load per square foot of floor area.

This deflection formula is backed up by tests on panels in buildings in which the measured deflections closely approximated those computed from this formula.

Another interesting test was that made on four panels on the tenth floor of the A. J. Franks Building, Chicago, in a manner very similar to that used by Mr. Lord, and hence will only be briefly referred to. A full description of the test, together with tables of measured stresses, are given in the report of W. K. Hatt, consulting engineer, compiled for, and published by the Concrete Steel Products Company, of Chicago. The floor was of the well-known "Cantilever Flat Slab" type, which is the trade-name of this company, analogous to the term "mushroom" used by Mr. Turner.

Under the design load of 256 pounds per square foot the maximum stress in the steel was 4,575 pounds per square inch, occurring in the cross-band over the capital; and the maximum stress in the concrete was 677 pounds per square inch occurring in the drop of a central column. Under a load of 624 pounds per square foot the maximum stress in the steel was 10,095 pounds per square inch in the centre of the span of the cross-band, and the maximum compressive stress in the concrete was 1,685 pounds per square inch in the drop of the central column. The maximum tension in the longitudinal column reinforcing due to eccentric loading occurred at a corner column and amounted to 5,000 pounds per square inch under the design load, and 11,600 pounds per square inch under the maximum load.

The above figures bring out the fact that the design is overbalanced with an excess of steel, that is, the maximum permissible stresses in steel and concrete are not simultaneously realized. This condition probably exists in all present designs for flat slab floors.

BELGIAN COAL PRODUCTION.

The total production of coal in Belgium during 1912 amounted to 22,983,460 tons, against 23,125,140 tons in 1911 and 23,927,230 tons in 1910. This decrease was due to the strike in the Borinage district at the beginning of the year, and also to the limiting of the day's work to 9 hours. Although this fresh decline in production may appear discouraging, it is in reality not unsatisfactory, says the American Consul at Liege, for, in spite of the further reduction of the working day from 9½ hours in 1911 to 9 hours in 1912, there was a decrease of only 141,680 tons, while the production for 1911 was 800,000 tons less than that of 1910; if the strike in the Borinage, which lasted over a month, had not taken place, causing a reduction in the output of 500,000 tons, the total output for 1912 would have been considerably greater than in 1911. The conclusion to be drawn from this is that the limiting of the working day has not had the disastrous results anticipated. The coal mines proceeded to improve their machinery, tools, etc., and the results for 1912 go to show that the increased effective power of the engineers offsets the reduced work of the miners.

GAS AND OIL ENGINES FOR ELECTRIC SUPPLY STATIONS.

By A. N. Rye.

From time to time a number of articles have appeared in the technical press dealing with the generation of electricity by gas and oil engines. Certain of these articles have dealt with private supplies, and have been of considerable interest, but the conditions of public supply are so different from private supply that it is by no means certain that a type of machine which has been satisfactory in one case will be equally satisfactory in the other case; for instance, the question of reliability is of so much more importance to a public supply than to a private plant.

The articles dealing with gas and oil engines for public supplies have, in many cases, been of the nature of estimates, and many engineers are not satisfied that the figures put forward can be obtained in actual practice. Under these circumstances engineers may be interested in the results obtained in a central station depending almost entirely upon gas and Diesel engines, where both classes of engines are run in the same power house by the same staff and under the same conditions.

The public supply of electricity in the Island of Guernsey is undertaken by the Guernsey Electric Light and Power Company, Limited, and was recently described by A. N. Rye in the Electrical Review. The supply was started in 1900 from a small station at Les Amballes, equipped with the plant usually installed about that date, i.e., Belliss engines, Babcock boilers, surface condenser, economizer, battery, etc.

At a later date a demand for power developed in the granite quarries at a distance of about 2½ miles from the generating station; as this load increased it became impossible to deal with it from the Les Amballes station, and a new power station was built at St. Sampson's in the centre of this load, and the Les Amballes station was continued principally to supply the lighting demand in and around the town of St. Peter Port.

TABLE I.—GAS ENGINES, ST. SAMPSON'S, 1912.

Month.	Units generated.	Tons coal.	Lb. per unit gen.	Per ton.	Cost.	Per unit.
January...	51,720	75	3·2	17/10	£66 17 6	·31d.
February	50,628	68·5	3·0	,,	61 1 6	·29d.
March ...	41,024	60	3·2	,,	53 10 0	·31d.
April ...	47,185	46	2·14	,,	41 0 4	·21d.
May ...	67,231	58	1·93	,,	51 14 4	·18d.
June ...	54,845	52·5	2·14	18/6	48 11 3	·21d.
July ...	67,465	67·5	2·2	19/-	64 2 6	·22d.
August ...	72,172	75	2·33	18/-	67 10 0	·22d.
September	79,527	73	2·06	19/6	71 3 6	·21d.
October ...	101,126	90	2·0	,,	87 15 0	·21d.
November	118,739	100	1·9	,,	97 10 0	·20d.
December	93,214	84	2·0	,,	81 18 0	·21d.
Total ...	844,876	849·5	2·25		£792 13 11	·225d.

The first plant installed in 1904 at the new station at St. Sampson's consisted of two gas-driven sets nominally of 180 kw. each, together with pressure gas producers and a battery of 1,200 ampere-hours, 420 volts, capacity. Later in 1908 another set of 220 kw. was added. Early in 1911 a Diesel driven set of 165 kw. was installed, and in December, 1912, another similar set was put down. At the old station at Les Amballes, certain steam plant was dismantled in 1911 and two Diesel-driven sets, each of 135 kw., were installed.