Briefly, then, civil engineering includes:

1. the location and construction of roads, streets, railroads, and canals;
2. the design and construction of works for water supply and sewerage, the regulation of rivers, construction of harbors and docks, the development of water-power, the drainage and irrigation of land, etc.,—all included under hydraulic and sanitary engineering, and based largely on a study of theoretical hydraulics and of hydrology;
3. the theory and design of the various structures necessary in the construction of the works referred to, including bridges, roofs, arches, dams, and other structures of stone, wood, and iron;
4. the science or art of surveying, which is the basis of all engineering field work, and which, when applied to large areas, becomes the science of geodesy, taking account of the curvature of the earth's surface.

Course I. aims to give the student such a training in the fundamental principles on which civil engineering is based, that he may be equipped to enter upon the pursuit of the profession, and with the aid of which he can rapidly acquire the practical knowledge which can only be gained by experience; a training which may serve as a foundation on which he may build quickly and safely, and as high as his talents and his perseverance may take him.

The civil engineer requires for his foundation, first, a thorough training in mathematics, mechanics, and physics, and a knowledge of physical geography and geology; second, a sound knowledge of all branches of surveying, both theoretically and practically; third, some knowledge of the principles of mechanism, and of the steam-engine; and, fourth, a thorough training in the application of the principles of mathematics, mechanics, and physics to the theory and design of engineering structures, the flow of water, the location of roads and railroads, and the various problems with which the engineer has to deal.

And beyond giving the student knowledge, the course aims to teach him two things important above all others,—to learn and to think; for without these he will never be able to grapple with new problems. The successful engineer, the man whose services are really valuable, is not he who can simply do again what he has once been shown how to do, but he who can meet emergencies when they arise, and solve new problems through a clear perception of the principles upon which they depend.

Equipped with such a training, a young man should be able not only to engage in some branch of the profession, but to enter upon various commercial pursuits connected therewith, as in the manufacture of certain materials of engineering, in the construction of city pavements, in the manufacture of railroad appliances of various kinds, such as signals, brakes, etc., and in other directions. He should also have an advantage in certain kinds of administrative work, as in connection with railroads and water works. Railroad managers and superintendents are frequently civil engineers; and considering the advantages of a good engineering training in all kinds of railroad work, this will probably be more frequently the case in the future than it is now or has been in the past.

Finally, as to the opportunities for young men graduating from Course I. In civil engineering, as in every other occupation, there are, of course, variations in activity; some years are years of unusual activity in construction, while financial conditions may sometimes lead to periods of depression. Considering the breadth of the field, however, and the opportunities in the maintenance of existing works as well as in the construction of new ones, there appears to be ample certainty that a young man well trained in civil engineering will soon find some occupation. It may only be said that during the past five years the demands upon the department for graduates have been far above what could be supplied,—even to over double the number of graduates at disposal, and that applications are already being made for graduates in 1890.