Row building in New York there are over six thousand inhabitants, with a vertical thoroughfare having twenty-five cross streets.

There are about a thousand offices in this building, with the top landing 294 feet from the ground floor. To provide transportation for these people, we find an equipment of ten elevators, each capable of carrying sixteen men, and making the trip to the top floor and back in three minutes. At this rate two hundred round trips a day are made by each elevator during business hours. On an average one need never wait more than eighteen seconds for a car, and a man at the top floor can reach the street in two minutes at the most. Each car averages sixteen passengers per round trip, and travels a distance of twenty-two miles a day. This means a total of 220 miles a day traveled by the cars altogether, or a distance stretching from New York to Washington. The elevator schedule in the Park Row building, as first arranged, provided for the running of five express cars and five locals. However, it was found that better time could be made even from the top floors when the cars were all run as locals, because since twice as many cars were thrown open to all the floors, the number of passengers taken on and off at each stop was decreased, and the saving thus occasioned more than overbalanced the time consumed by the slight increase in the number of stops.

A notable example of the use of express elevators may be found in the Broad Exchange building, New York city. In this building there are 1,400 offices, and eighteen elevators are provided for the transportation of the seven or eight thousand occupants. Half of these elevators make no stop between the first and eleventh floors, and the other half travel no higher than the eleventh floor. This arrangement affords greater economy of space, because, instead of continuing the elevator shafts of local cars up to the top of the building, the space from the twelfth floor up is employed for other valuable purposes.

From the foregoing it will be seen that while, as previously stated, the vertical growth of our cities was made possible by the use of steel in building construction, no such development would have resulted without the introduction of elevators to make tall buildings profitable.

Public attention was first directed to the advantages of elevators at the time of the New York World's Fair in 1853, when Mr. E. G. Otis gave an exhibition of his patent safety device in the Crystal Palace. A great impression was made on the spectators when the inventor, after running his car to the top of the shaft, cut the supporting ropes and descended safely to the main floor. The next year Mr. Otis secured a bit of land at Yonkers on the Hudson, and began the business of manufacturing elevators. It was not until 1859 that the first independent elevator engine was built, and a dozen more years passed before the hydraulic elevator was developed. Since that time we have had one more important innovation, that of the electric elevator, which was first introduced to the public in 1888. At present there are five distinct types of hydraulic elevators. Of these, the vertical cylinder type is the oldest and most common. Another type which differs from this only in the position of the cylinder is the horizontal cylinder type, which is found useful where space in the shaft is more valuable than that in the basement. In these two types a pressure of 150 pounds to the square inch is commonly maintained. Where it is necessary to have the elevators scattered about in various parts of the building, the high-pressure inverted-cylinder type is most useful. The power which is developed in one portion of the building can, by this means, be more widely distributed, and the machinery may also be made more compact. Two other types, the pulling plunger and direct lift, complete the list of hydraulic elevators. In the pulling plunger type no counterweight is used, but the plunger is made heavy enough to raise the car by its own weight, while hydraulic pressure is exerted to lift the plunger when the car is descending. In the direct-lift elevator the cylinder and piston are situated in a shaft sunk into the ground a distance equal to the desired travel of the car. This type is commonly used for freight, though it makes an excellent elevator for passenger service as well where conditions permit, because no energy is lost in the transmission of power, but the piston acts directly on the car.

In electric elevators the driving means of course is an electric motor, which operates a winding drum through suitable gearing, but the most important feature of the electric elevator is the device for starting the motor. Of course, it would not do to provide a starting box on the car, for the careless operator would be too apt to suddenly turn on the entire current and burn out the motor. On this account automatic devices for gradually cutting out the resistance are provided. The operator has no control over the action of this device except to start, stop, and reverse the same.

Although a great many improvements have been made in the motor mechanisms of elevators, the safety device now commonly used does not differ materially from that which proved its worth thirty years ago, such changes as have been made being principally due to increased speed of travel and heavier loads now carried. When we stop to consider that more rides are taken daily on elevators than in the street cars of our cities, the safety of these conveyances may be appreciated. Accidents on elevators occur so rarely that the daily papers usually accord them the prominence of a front-page article with a glaring title.

A type of electric elevator which is coming into great prominence is the automatic elevator for private residences. This is operated by a set of push buttons, and requires no elevator man. If someone on the second floor desires to go up to the fifth, he first presses a button that brings the car, if idle, up to his landing. As soon as the car comes to a stop, and not before, the door at the landing is automatically unlocked, so that the person can open it and enter the car. The door must then be closed before the car may start up again. A button marked "Fifth Floor" is now pressed, and the car is started up automatically, stopping when the fifth floor is reached. While in motion the car throws out of circuit the buttons of all the floors except that to which it is destined, thus preventing interruption until the trip has been completed.

In closing we must not neglect to mention the escalators or moving stairways, which are growing in prominence as a means for carrying large crowds for short distances. This type of elevating device gives promise of a great future, and should prove an important factor in our progress toward the city of theoretically perfect development.

THE BRITISH BATTLESHIP CONSTRUCTION PROGRAMME FOR 1903.

BY OUR LONDON CORRESPONDENT.

Owing to the exceptional activity being displayed by the various great powers and the augmentation of their respective navies by the embarkation upon elaborate naval programmes, the Admiralty scheme of Great Britain for the present year is very extensive, in order to maintain the necessary superiority of the English navy, and to preserve the balance of power. The 1903 programme provides for the construction of forty-two new vessels of all descriptions, comprised as follows:

Battleships	3
First-class armored cruisers	4
Third-class cruisers	3
Scouts	4
Destroyers	15
Submarines	10
Coastguard cruisers	2
River gunboat	1
Total	42

The total cost of these new vessels amounts to $50,682,150, which is an excess over the sum similarly devoted to the 1902 building programme of $5,389,550, while the total sum to be expended upon the navy during the present year is $172,287,500, an increase of $16,010,000 upon the previous year.

In addition to the foregoing new vessels, which are to be laid down at once, the following ships are now in course of construction:

Battleships	11
Armored cruisers	19
Second-class cruisers	2
Third-class cruisers	4
Scouts	4
Sloops	2
Destroyers	19
Torpedo boats	8
Submarines	3
Total	72

And of these, six battleships, eleven armored cruisers, and the majority of the other vessels will be in commission before April 1, 1904. During the past year the British navy has been increased by the addition of 4 first-class battleships, 5 armored cruisers, 2 sloops, 4 destroyers, 3 torpedo boats, 6 submarines and one or two other minor vessels.

The imperative and vital necessity of rapid construction is fully realized by the Admiralty, and in order that the vessels in the new programme may be constructed without any delay, such as necessarily arises in the government dockyards, all the vessels in the 1903 scheme, with one exception, will be built in private shipyards. In order that the new vessels may be turned out by the contractors completely equipped and ready for service, and in view of the up-to-date equipment of the private shipyards, the contractors will be required to complete the ships in all respects ready for commission, i. e., not only build the hull of the vessel, but supply the armament as well.

The estimates do not afford any indication concerning the design of any of the new ships, but it is generally understood that the battleships will possess the further improvements in respect of gun power on the "King Edward VII." class outlined in a recent issue of this journal, and that they will cost approximately $7,000,000 each. The construction of the ten submarines is to be hurried forward as quickly as possible. In their design they will embody several improvements, especially in the system of propulsion, the gasoline engines which in the existing craft have proved unreliable and generally unsatisfactory being superseded by improved propelling machinery. During the year $16,500,000 is to be spent on armaments, as follows: Seven 12-inch 50-ton guns, 23 of 9.2-inch caliber, 60 6-inch quick firers, and 159 smaller guns; but there will also be completed, including guns already ordered, 12 12-inch 50-ton guns, 11 of 9.2-inch caliber, 10 of 7.5-inch, 136 of 6-inch caliber, and 224 smaller weapons.

Concerning the royal naval reserve of merchant cruisers, the list is practically the same as before, consisting of the three White Star boats, "Oceanic," "Majestic," and "Teutonic"; three Cunarders, "Campania," "Lucania," and "Umbria"; four P. and O.'s, two Orient liners, two Royal Mail boats, the Pacific liner "Ortona," and the three Empresses of the Pacific. For these vessels a subsidy of $389,065 is to be paid. In addition to the above list there are 31 steamers belonging to these respective companies held at the disposition of the Admiralty without further subsidy.

The Admiralty have not lost sight of the applicability of liquid fuel to battleships, and experiments are being carried out upon the new turbine torpedo-boat destroyer "Velox" and upon two battleships. Great difficulty is being experienced in adapting liquid fuel to war vessels, since oil fuel is of no advantage to the navy, as compared with Welsh steam coal, unless the combination can be brought to such perfection as to render the fuel practically smokeless.

One of the most important new departures in the administration of the navy is the appointment of a small committee composed of the highest recognized authorities on marine engineering in the country, to be at the disposal, when required, of the controller of the navy, so that the Admiralty board may profit by any advice or suggestions that may be proffered relative to any questions concerning vessels.

Furthermore, a new squadron is to be created—the South Atlantic squadron—which will serve the southeast coast of America and the west coast of Africa, and use Gibraltar and Sierra Leone as its bases.

VULCANIZED TIMBER IN ENGLAND.

A considerable amount of interest has been aroused by the announcement, as the result of a prolonged series of experiments, of a method of so treating timber as to secure even from soft wood a largely increased toughness and hardness. The process is described as one of vulcanizing, comparable in some respects with Bessemer's process of converting iron into steel, and is the invention of Mr. Powell, a Liverpool merchant. The treatment to which the timber is subjected is, roughly speaking, that of saturation at boiling point with a solution of sugar, the water being afterward evaporated at a high temperature. The result is to leave the pores and interstices of the wood filled in with solid matter, and the timber vulcanized, preserved, and seasoned. The nature of moderately soft wood, it is claimed, is in this way changed to a tough and hard substance, without brittleness, and also without any tendency to split or crack. It is also rendered remarkably impervious to water. Hard wood similarly treated derives similar benefits. Moreover, it is claimed that the process may be completed and timber turned out ready for use in a few days.

"CALLITYPY."

Most of our readers will probably remember the discussion carried on in our correspondence columns on the possibility of using the ordinary typewriter for the purpose of making a matrix to cast printing types. Some of the critics of this plan contended that it would be impossible to bring the ends of the lines in absolute vertical alignment and that, furthermore, the difficulty of making corrections was insuperable. In the current SUPPLEMENT will be found an article by Jacob Backes on "callitypy," a new printing system, in which it is explained how the ends of the lines may be brought to register. In carrying out the system described, the printing plant used consisting of one or more writing machines of any standard make, sheets of white paper, a square, a ruler, firm white cardboard are the only utensils required. It is true that callitypy is to be used primarily for the purpose of making line engravings of typewritten matter as a substitute for direct printing without recourse to typesetting or line-casting. Nevertheless, the system shows that it is at least possible to overcome some of the objections which have been advanced to the use of the typewriter as a means of making the matrix for the casting of type.