high, and whole dwellings are not to be hoped for by persons of small means. There is no reason, however, why houses, varying from two to four stories in hight should not be constructed with a view to the accommodation of gentlemen's families, or those, who, respecting themselves, regard their neighbor's comfort and convenience also.

Houses built in "flats," so termed, are common in Europe where taxes are great and many persons of the highest social culture and standing occupy said flats to their very great convenience. All the necessary fixtures and appurtenances belonging to housekeeping may be found on one floor, and within the limits of 100 by 25 feet, or less, according to rent, and the tenant is as much at home, as private and safe from inquisitive neighbors as any one can be under such circumstances. Dumb waiters for raising coal from the cellar, places for storing the odds and ends of housekeeping, laundries for getting up the linen, airy, well ventilated rooms for living, and above all sleeping in, kitchen with hot and cold water, bath room, in short the usual appliances of civilized life should be the distinguishing features of such houses and the demand for them is yearly increasing.

There are a few houses now in this city on such plans and they are secured immediately as soon as vacated; palpable proof of the estimation they are held in. An improvement on the plan of each tenant purchasing his own coal would be a heater in the cellar where, for a stipulated price the landlord could in cold weather heat the premises night and day with great economy; fuel for cooking alone would then be necessary.

Hundreds, yes thousands of our citizens are annually flying to the suburbs from the simple impossibility of living longer in the city under ordinary circumstances, and sooner or later such buildings as we have described will be indispensable in this and other large cities.

GUNPOWDER EXTRAORDINARY.

Under this head the *Mechanics' Magazine* describes the process of manufacturing a new kind of gunpowder which has been patented in the principal countries of Europe, by Captain Schultze, of the Prussian artillery. Our cotemporary says that the new article, "while being nearly four times as powerful as gunpowder, costs, weight for weight, considerably less than gunpowder, and can be used in precisely the same way as gunpowder, its substitution for gunpowder requiring no new method or precaution beyond that of using of the new powder only one-fourth as much as of the old.

"To this it must be added that Capt. Schultze's powder does not foul the guns in which it is used; that the products of its combustion are perfectly transparent gases, offensive neither to the eyes nor to the lungs, and lighter than atmospheric air, so that they soon pass away; and that its manufacture is much safer than that either of gunpowder or guncotton.

"The first process in the manufacture of the new powder is to cut some wood—we are told that any kind will do, but that the harder it is the stronger it will be—into sheets or veneers, of a thickness equal to the diameter which it is desired that the grains of the powder to be produced shall have. For powder to be used for ordinary small arms, Capt. Schultze recommends that the sheets be about one-sixteenth of an inch thick. These sheets, whatever their thickness, are cut up by a punching apparatus into little cylinders, of diameter slightly less than the thickness of the sheets from which they are cut. The cylinders thus obtained constitute, eventually, the grains of the new powder, which is thus granulated at the beginning, instead of, like the ordinary gunpowder, at the end, of its process of manufacture. In order to remove from these cylinders, or grains, all their constituents other than cellulose, they are boiled for about eight hours, in a copper kettle, in a strong solution of carbonate of soda, the solution being changed as often as it becomes discolored; they are then kept in a stream of running water for twenty-four hours; and are next steeped for about two or three hours, being constantly stirred all the time, in a solution either of chloride of lime or of chlorine gas. They are then well washed, first in cold water and afterwards in hot; and are finally kept a second time for twenty-four hours in pure cold running water. They are then submitted for six hours to the action of a mixture of forty parts by weight of concentrated nitric acid with a hundred parts by weight of concentrated sulphuric acid, one part by weight of the grains being placed with seventeen parts by weight of the mixed acids in an iron vessel, which should either be placed in a powerful refrigerating mixture, or have cold water constantly circulating around it. At the end of six hours the grains are taken out, and carefully drained from all adhering acid. They are then kept in cool fresh running water for two or three days, then boiled in a weak solution of carbonate of soda, then exposed to running water again for twenty-four hours, and then dried as completely as possible. Captain Schultze states—somewhat to our surprise—that up to this point the grains are not explosive, and that this drying operation therefore involves no danger. When fully dried, the grains are ready for the last operation but one, which consists in steeping them for ten minutes in a solution of some salt or salts containing oxygen and nitrogen. Captain Schultze prefers nitrate of potash (saltpetre), or nitrate of barytes, or, what he finds is better still, a mixture of both. He recommends for every hundred parts by weight of the grains, two hundred and twenty parts of water having dissolved in it twenty-seven and a half parts of potash and seven and a half parts of nitrate of barytes. The temperature of the solution should be 112 deg. Fah. After having been stirred about in this solution for ten minutes, the grains have only to be taken out and drained, and then dried. The drying must be done, this time, in a chamber kept at a temperature of from 90 to 112 deg. Fah., and will occupy about eighteen hours."

Cotton fiber is almost pure cellulose, and wood fiber is mostly cellulose, but containing gums and other substances. Cellulose is composed of carbon, hydrogen and oxygen in the proportion of 6 atoms of carbon, 10 of hydrogen, and 5 of oxygen, C_6, H_{10}, O_5. As it takes one atom of oxygen to burn one of hydrogen to water, HO, and two of oxygen to burn one of carbon to carbonic acid, CO_2, it is plain that 22 atoms of oxygen would be required to effect the complete combustion of the carbon and hydrogen in one atom of the celloluse, 17 more than is contained in the cellulose. To burn cotton or wood, therefore, a supply of oxygen must be furnished from the atmosphere or some other source. In gunpowder this is not required, as the saltpeter contains sufficient oxygen to effect the combustion of the sulphur and carbon. Gunpowder, therefore, will burn in a close vessel excluded from the air, while cotton or wood would be extinguished.

Guncotton is made by treating the fiber of cellulose with nitric acid, NO_5; the acid loses, 1 atom of oxygen, becoming NO_4, and this enters into the compound, displacing a portion of the hydrogen. The proportion of hydrogen displaced depends upon the mode of treatment. In photographic guncotton the quantity of oxygen carried into the compounds is not sufficient to effect the complete combustion of the hydrogen and carbon, consequently, if photographic guncotton be set on fire in a close vessel, only a portion of it will be burned. By Baron Von Lenk's treatment the quantity of oxygen introduced is sufficient to complete the combustion, hence the explosive quality of his cotton.

As Captain Schultze's cellulose after it streatment by acids is not explosive, it is manifest that the process does not convert it into the tri-nitro-cellulose of Baron Von Lenk, hence the necessity for the addition of nitric acid in combination with either potash or barytes.

A TRUE HERO.

"He that ruleth his own spirit is better than he that taketh a city." Gen. Grant, according to this statement, is a hero in the highest sense. Having fought nearly a whole year for the possession of Richmond, and having captured the city with its defending army, it would not have been unnatural had the General, following innumerable precedents, desired to enter in triumph as a conquering hero. Few men could have withstood the temptation. But Grant, whose modesty equals his military genius, stopping not for such momentary gratification, considering this no time to indulge in military displays, hastens to Washington to attend to the legitimate duties of his position. Declining all public ovations, he goes at once to the War Department, and, as the result of his advice, the following orders will be immediately issued:—

To stop all drafting and recruiting in the loyal States.

To curtail purchases of arms, ammunition, Quartermaster and Commissary supplies, and reduce the expenses of the military establishment in its several branches.

To reduce the number of general and staff officers to the actual necessities of the service.

To remove all military restriction upon trade and commerce, so far as may be consistent with public safety.

It is estimated that these orders will save to the Government one million dollars per day. Gen. Grant thus shows himself to be not only a military hero, but also a true friend to the people.

HORSE POWER.

When Watt began to introduce his steam engines he wished to be able to state their power as compared with that of horses, which were then generally employed for driving mills. He accordingly made a series of experiments, which led him to the conclusion that the average power of a horse was sufficient to raise about 33,000 lbs. one foot in vertical hight per minute, and this has been adopted in England and this country as the general measure of power.

A waterfall has one horse power for every 33,000 lbs. of water flowing in the stream per minute, for each foot of fall. To compute the power of a stream, therefore, multiply the area of its cross section in feet by the velocity in feet per minute, and we have the number of cubic feet flowing along the stream per minute. Multiply this by $62\frac{1}{2}$, the number of pounds in a cubic foot of water, and this by the vertical fall in feet, and we have the foot-pounds per minute of the fall; dividing by 33,000 gives us the horse power.

For example:—A stream flows through a flume 10 feet wide, and the depth of the water is 4 feet; the area of the cross section will be 40 feet. The velocity is 150 feet per minute—$40\times150=6000$=the cubic feet of water flowing per minute. $6000\times62\frac{1}{2}=375,000$= the pounds of water flowing per minute. The fall is 10 feet; $10\times375,000$=the foot-pounds of the water fall. Divide 3,750,000 by 33,000, and we have $113\frac{21}{33}$ as the horse power of the fall.

The power of a steam engine is calculated by multiplying together the area of the piston in inches, the mean pressure in pounds per square inch, the length of the stroke in feet, and the number of strokes per minute; and dividing by 33,000.

Water wheels yield from 50 to 91 per cent of the water. The actual power of a steam engine is less than the indicated power owing to a loss from friction; the amount of this loss varies with the arrange ment of the engine and the perfection of the work manship.

The Atlantic Telegraph.

Captain James Anderson, of the Cunard mail steamer *China*, has been appointed to command the *Great Eastern* during the laying of the Atlantic Telegraph cable. The *Great Eastern* will sail from Valencia, Ireland, about the 1st of July, and may be expected at Heart's Content, Trinity Bay, by the middle of that month. There were sixteen hundred and sixty-two nautical miles of cable completed on the 21st of March, and the whole twenty-three hundred miles will be made and on board of the *Great Eastern* in May.

The English Admiralty have agreed to order two powerful steamers of the Royal Navy to accompany the *Great Eastern* from Ireland to Newfoundland, and also to direct Vice Admiral Sir James Hope to afford such assistance on the approach of the expedition to Newfoundland as may be in his power.

It is confidently expected that Europe and America will be in telegraphic communication before the 20th of July.

GREAT GUNS.—The iron-clad *Stonewall* turned tail and ran away from two wooden ships with nothing but great guns and stout hearts to protect them.