

our position by that section of the press which is entitled to speak with authority on a question of this special nature.

**THE FOUR NEW MONITORS.**

The designs for the four new monitors called for by the Naval Appropriation Bill have been determined upon by the Naval Board of Construction. Their displacement will be about 2,500 tons on a draught not to exceed 11 feet. They will be furnished with watertube boilers and twin-screw engines of 3,500 horse power, which will be expected to drive the monitors at 12 knots under natural and 13 knots under forced draught. They are to be furnished with a single turret and a fighting mast. The turret will be carried well forward clear of obstructions. It will be protected by 12 inches of Harveyized steel, and within it will be two of our latest pattern of 10-inch rifles. On a superstructure deck amidships will be placed several 4-inch rapid-fire guns and a numerous battery of 6 and 1-pounders and machine guns. The new monitors will sit low in the water, having a freeboard of only 20 inches, and as the belt armor will consist of 11 inches of Harveyized steel, the new vessels will be very difficult objects for the enemy to hit and disable. The small draught of 11 feet will enable them to navigate shallow channels and shoals in our harbors which would be impassable to the deep draught sea-going craft of the enemy.

It will be seen that the new monitors will be 1,500 tons smaller than the "Terror," "Amphitrite" and "Miantonomoh" and 3,500 tons smaller than the "Puritan." Their speed will be about 2 knots greater than the first named boats and about the same as that of the "Puritan." They will carry only half the number of heavy guns, but their handiness, light draught and powerful secondary batteries and general up-to-date efficiency will render them scarcely less powerful than the ships of the "Terror" class.

**ELECTRICAL EXHIBITION.**

When we realize the multiplicity of uses to which electricity lends itself, it is little wonder that an exhibition could be inaugurated which would occupy every inch of space in the largest building available for the purpose in New York City.

Among the newer objects shown are the Edison magnetic ore separator, fully described some months since in the SCIENTIFIC AMERICAN. A large working model of this invention shows how the magnetic ore is separated from sand by the action of a magnet. Wireless telegraphy, also described in our columns not long since, is shown in actual operation. There is a large exhibit of Weston's fine testing and measuring instruments, designed for all purposes, including their use in generating stations, institutions of learning, as well as in the laboratories of private individuals. The Walker underground conduit system, lately installed on the Fourth Avenue street railway in this city, is represented by a section of full sized track and a motor car arranged to permit of examination by visitors who are interested to know how this system is operated. The Crocker-Wheeler exhibit includes a 225 horse power dynamo and several other large dynamos and motors; also motor dynamos. A motor especially adapted for use in mills is found here. The exhibit is very creditable, showing improvements in design and finish.

An exhibit showing the extended use of electricity is an emergency wagon, containing tools and materials for electrical repairs of all kinds. The American Electrical and Maintenance Company are represented by this exhibit.

The Electric Storage Battery Company's exhibit is especially noticeable on account of the giant accumulators shown. They are of a type used in Chicago and in the Brooklyn Edison Illuminating Station. One of these cells can give 2,000 amperes for one hour and the other 6,000 amperes for one hour.

The Montauk Multiphase Cable Company have on exhibition their automatic thermostatic protective electric cables. This system gives to wires the power to discover dangerous heat or flame, and automatically to notify at any point or points desired that such heat or flame is in existence, and this upon its inception. The exhibit is attracting much attention on account of its possible application to government use in the present crisis.

The domestic uses of electricity are shown by utensils for cooking according to every conceivable method by heat generated by electricity. The advantages gained by this method are cleanliness, avoidance of unnecessary heat, obviating the necessity of handling coal and ashes, and the saving of room. Another domestic application of electricity is an electrical cradle rocker.

In the generating section are shown two Babcock & Wilcox steel boilers of 265 horse power each, which provide steam for the exhibition. These boilers are furnished with low grade fuel and the fire is urged by a forced draught created by a large fan blower driven by a small engine supplied with steam from the boilers. The steam pressure controls the motion of the engine, the blast being thus varied to suit the requirements. As a consequence, a uniform pressure of steam is maintained and fuel is saved. This system of controlling

the pressure by action on the fire by means of a variable forced draught is known as the Beckman system of automatic control. It is exhibited by the Kensington Engine Works, Limited, of Philadelphia.

Several high-speed steam engines driving direct-connected dynamos are shown.

The Woodbury high-speed engine with an Eddy dynamo directly attached is running. It does its work quietly and without apparent effort.

The Onondaga Dynamo Company also have a high-speed engine with one of their own dynamos direct connected. The engine runs smoothly, without a click or a jar.

There is also shown a Fischer engine with a direct-connected dynamo.

The American Engine Company exhibit an American Ball engine direct-connected to a 25 K. W. generator built by the same company.

The Armington & Sims Company exhibit a 13-inch by 12-inch engine direct-connected to a Walker generator, and the New York safety steam engine is shown connected directly with a dynamo constructed according to the Wood system by the Fort Wayne Electric Company. These engines and dynamos show to what perfection the apparatus for the generation of electricity has arrived.

The Hornsby-Akroyd safety oil engines are exhibited. These engines are operated by the vapor of kerosene oil, the oil vapor being ignited without the use of hot tubes, flames or electric sparks, as usual in gas engines.

The National Meter Company have on exhibition a 70 horse power gas engine connected direct to a generator. It does its work without trouble and is a compact and desirable form of motor.

The Diesel motor is the more recent of gas engines. It operates on a new principle. It follows the lines of a vertical marine engine and is connected directly with a dynamo. The motor cylinder is placed on a stout A-frame, in the rear leg of which a small air pump is secured. The action is on the 4-stroke or Otto cycle. It differs from all previous internal combustion engines in compressing a full charge of air to a point above the igniting point of the fuel, whether liquid or gaseous, then injecting the fuel for a certain period (variable according to load) into the red hot air, where it burns with pressure and temperature under control. There are no explosions, as in other gas or oil engines, but steady combustion at much lower temperature and without essential increase in pressure, the combustion line being practically isothermal. It is claimed that fully 28 per cent of the value of the fuel is utilized. This motor was fully described in a recent issue of this journal.

**CALCIUM CARBIDE AS AN AID TO FIRE.**

In the SCIENTIFIC AMERICAN for May 7 we referred to a fire caused by water coming in contact with calcium carbide. We are informed by the Creig-Reynolds Foundry Company, of Dayton, Ohio, we were in error in reporting the fire at their works as a carbide fire. The fire started in the extreme end of their warehouse building, some hundred or more feet from the carbide, and when the flames reached the carbide cans the solder was rapidly melted and the carbide, being surrounded by water, generated gas immediately, which was communicated to the flames and, consequently, made a great blaze; but, out of some 8 or 10 tons of carbide on hand, they lost less than 1,500 pounds. In no way can the fire be attributed to the storage of the carbide, and it was not to blame in any way for the origin of the fire; but the very fact that the carbide assisted the conflagration shows that the regulations regarding the storing of carbide in quantities in some cities have not been made in vain.

**UNITED STATES ARMY RECRUITING CIRCULAR.**

WAR DEPARTMENT, ADJUTANT-GENERAL'S OFFICE, WASHINGTON, April 27, 1898.

The following instructions will govern recruiting for the regular army in time of war:

Applicants for enlistment must be between the ages of 18 and 35 years, of good character and habits, able-bodied, free from disease, and must be able to speak the English language. Married men will be enlisted only upon the approval of a regimental commander. Minors must not be enlisted without the written consent of father, only surviving parent, or legally appointed guardian. Boys between the ages of 16 and 18, who may be needed as musicians, may be enlisted as such, with the approval of the proper commanding officer. Original enlistments will be confined to persons who are citizens of the United States, or who have made legal declaration of their intention to become citizens thereof. Applicants will be required to satisfy the recruiting officer regarding age and character, and should be prepared to furnish the necessary evidence.

For infantry and artillery the height must be not less than five feet four inches, and weight not less than one hundred and twenty pounds and not more than one hundred and ninety pounds.

For cavalry the height must be not less than five

Table of Physical Proportions for Height, Weight, and Chest Measurement.

HEIGHT.		WEIGHT.	CHEST MEASUREMENT.	
Feet.	Inches.	Pounds.	At expiration: Inches.	Mobility: Inches.
5 1/4	64	128	32	2
5 3/4	65	130	32	2
6 1/4	66	132	32 1/2	2 1/4
6 3/4	67	134	33	2 1/2
7 1/4	68	141	33 1/2	2 3/4
7 3/4	69	148	34	2 3/4
8 1/4	70	155	34	2 3/4
8 3/4	71	162	34 1/2	2 3/4
9 1/4	72	169	34 1/2	2 3/4
9 3/4	73	176	35 1/2	3

feet four inches and not more than five feet ten inches, and weight not to exceed one hundred and sixty-five pounds. No minimum weight is prescribed for cavalry, but the chest measures must be satisfactory.

It is not necessary that an applicant should conform exactly to the figures indicated in the table of proportions, the variation of a few pounds in weight either way, and of a fraction of an inch in chest measures, being permissible.

Applicants must defray their own expenses to the place of enlistment. Their fitness for the military service can be determined only upon examination at a military post or other recruiting station.

The term of service is three years.

All soldiers receive from the government (in addition to their pay) rations, clothing, bedding, medicines, and medical attendance.

The following are the rates of pay as fixed by law:

Grade.	Pay per month.	Pay per year.	Pay for 3 years.
<b>COMPANY.</b>			
Privates—Cavalry, Artillery, and Infantry.....	\$13	\$156	\$468
Field Musicians—Cavalry, Artillery, and Infantry.....	13	156	468
Wagoners—Cavalry, Artillery, and Infantry.....	14	168	504
Artificers—Artillery and Infantry.....	15	180	540
Saddlers—Cavalry and Light Artillery.....	15	180	540
Farmers and Blacksmiths—Cavalry and Light Artillery.....	15	180	540
Corporals—Cavalry, Artillery, and Infantry.....	15	180	540
Sergeants—Cavalry, Artillery, and Infantry.....	18	216	648
Quartermaster Sergeants—Cavalry and Light Artillery.....	18	216	648
Veterinary Sergeants—Light Artillery.....	18	216	648
First Sergeants—Cavalry, Artillery, and Infantry.....	25	300	900
<b>REGIMENT.</b>			
Quartermaster Sergeant—Cavalry, Artillery, and Infantry.....	23	276	828
Sergeant-Major—Cavalry, Artillery, and Infantry.....	23	276	828
Saddler Sergeant—Cavalry.....	22	264	792
Chief Trumpeter of Cavalry.....	22	264	792
Principal Musician—Artillery and Infantry.....	22	264	792

To the rates of pay enumerated above 20 per centum will be added in time of war.

In addition one dollar per month for the third year of enlistment will be paid to the soldier. Soldiers reenlisting within three months from date of discharge receive a further increase of pay for the fourth and fifth years of service, and a still further increase for each five years of continuous service.

The soldier can deposit his savings in sums not less than \$5 with any army paymaster, and for sums so deposited for the period of six months or longer, the soldier, on his final discharge, will be paid interest at the rate of four per cent per annum. These deposits are nonforfeitable except for desertion.

Whenever a soldier is honorably discharged at the expiration of his enlistment, or on account of disability not caused by his own misconduct, his travel pay is ample to carry him to the place of enlistment.

By care and economy, a soldier can save from his clothing allowance a considerable sum, payable to him on his discharge.

For soldiers who have served honestly and faithfully twenty years, or who have been discharged for wounds received or disease incurred in service, a comfortable home is maintained in the city of Washington. The sum of 12 1/2 cents per month is deducted from each soldier's pay, to be applied toward the support of the home. After thirty years' service enlisted men are entitled to be retired, and upon retirement receive three-fourths of the monthly pay allowed by law to them in the grade they held when retired, and \$9.50 per month as commutation for clothing and subsistence.

By order of the Secretary of War.

H. C. CORBIN, Adjutant-General.

PROF. RAY LANKESTER, in a recent lecture in England, gave a clear and easily understood explanation of how inoculations of mild disease will cure or prevent the severer kinds. Protoplasm, he said, has the capacity for being taught to tolerate a chemical action from which it naturally shrank. A mass of protoplasm attracted in the direction of a solution of sulphate of iron would at first grow down to the edge of it and then draw back, but in a little time would plunge boldly through and across it, and this protoplasm thenceforth would have no fear of sulphate of iron. The amoeboid corpuscles of the blood are attracted by what is called "chemotaxis" to the germs of disease entering the body, and swallow them up; but these bacteria in their turn produce a poison which repels the corpuscles. The latter, however, can be taught by gradually increasing doses to tolerate the poison, and in this way the body can acquire an immunity against even the full strength of the disease.