in diameter, in three pairs, connected by heavy expansion gearing at each end of the rolls. The rolls and upper cylinder can be elevated to take in lumber five inches in thickness. The upper rolls of the contiguous pairs are adjusted simultaneously by means of a hand wheel with geared connections.

The under cylinder is adjustable vertically for graduating the thickness of the cut, and is placed so that the discharging rollers carry the lumber from it. This is a novel and distinguishing feature of this planer, the rolls through which the lumber last passes being placed outside of the under cylinder and bending pressure bar, which is placed and adjusted over the under cylinder.

These rolls are usually placed in the machine so that the under cylinder does not commence cutting until the board has passed some distance through, and consequently a portion of the board must depend upon being driven over the under cylinder by the board following. This defect is obviated by the new position of the cylinder and the discharging rolls.

Accessibility to the under cylinder is facilitated by the method adopted of moving the discharging rolls by revolving the end of the machine supporting them upon a hinge in one side of the frame; and the pressure bar over the under cylinder, being revolved upon one of its supports, leaves the under cylinder entirely open for any purpose of adjustment the operator may desire. The side cutterheads, being adjacent to the under cylinder, can also be more readily adjusted by virtue of the position thus attained.

This arrangement is a very desirable one, and the end of the machine is claimed to lose none of its stability, as the supports are of the most permanent character, easy of access and attached or detached very quickly.

The lower roller on the movable end of the machine has a vertical movement to compensate for any changes in elevation of the under cylinder, and in order that a constant pressure may be retained upon the lumber by keeping the peripheries of the cylinder and roller in the same relative position.

One of the machines may be seen on exhibition in daily operation in Machinery Hall, section B 8, columns 61, 62, 63, Centennial Exhibition, Philadelphia, or further particulars can be obtained by addressing the manufacturers at Cincinnati, Ohio.

[For the Scientific American.]

THE EXHIBIT OF CORNELL UNIVERSITY AT THE CENTENNIAL.

In the account of technical schools recently published in the SCIENTIFIC AMERICAN, the exhibit of the mechanical engineering department of Cornell University was omitted, as the articles shown by this school are of such an interesting character as to warrant a separate description.

Cornell University, as most of your readers doubtless know, furnishes courses in almost every branch of learning; but the present notice must be confined to the practical part of the course in mechanical engineering. This course covers a period of 4 years, during which each student is required to work for 10 hours a week in the shop. Some of the results of this work are shown at the Centennial, and the visitor is not deterred from making a critical examination by notices that handling is forbidden, but, on the contrary, is invited to subject the articles to any test that he may desire. Some surface plates, placed upon a low table, are particularly inviting to the passing visitor, who can make one plate float upon the other, and, after working out the air between, can lift the pair by grasping the upper one. These surface plates are a regular article of manufacture at Cornell University, and are sold at such a reasonable price (10 cents a square inch) that it is a matter of surprise to find that they are not in great demand. The scholars also make steel triangles for the use of draftsmen, and these will be found very serviceable for nice work. Professor Sweet, who is in charge of the practical course at Cornell University, proposes to add, to the articles manufactured for sale, solid calipers, accurately ground to standard sizes, which will be as useful as the well known Whitworth gages, and much cheaper. A necessary machine in connection with this manufacture is an instrument for accurate measurement; and a measuring machine reaching to ten-thousandths of an inch has been made at the school. This is constructed on the general principle of Whitworth's measuring machine, but has some important improvements. The principle of the machine is the same as that of the sheet metal gage made by Brown & Sharp, in which the measuring points are brought together by a screw, and the fractions of the revolution are measured on a wheel attached to the screw. In the machine under consideration, the screw has a pitch of $\frac{1}{16}$ of an inch, and the wheel is divided into 625 equal parts, each of which measures a movement of $\frac{1}{10000}$ of an inch. In the use of a machine of this kind, it is found that, if several operators each measure the same article, adjusting the points by their judgment, their results will vary sensibly; and one of the improvements of the present machine consists in having the handle which moves the screw independent of it, being kept in contact by friction until the measuring point bears against the article to be measured, when it slips. Another important improvement over the Whitworth machine is the use of a short screw, and a nut of the same length. By this arrangement, the motion of the measuring point attached to the screw is only about an inch, but the other point is adjustable on a slide to any desired distance up to one foot, so that the range of the machine is for articles from $\frac{1}{10000}$ to 12 inches, varying by ten-thousandths. A steam engine, built by the students, from Professor Sweet's design, has several novel features. The frame has three supports, the cylinder resting in a socket upon one, and being free to move under changes of temperature. The piston is made very long, and has a number of grooves, no packing being used. The piston rod passes through a grooved tube, without any packing, and the valve stem, also without packing, works through a plain brass tube of considerable length. The valve consists of two flat plates, accurately fitted to the valve seat and an upper plate, thus being perfectly balanced, and being made very thin, to obviate as far as possible the difficulties caused by unequal expansion. The governor is attached to the fly wheel, and is connected with the eccentric, which swings round a point near one edge, under the action of the governor. The effect of moving the eccentric is to change the amount and period of opening of port, while the lead remains practically constant. The eccentric acts on the valve stem through the medium of a bell crank lever, so as to equalize the cut-off at each end of the cylinder. The valve motion of this engine, it will be seen, is quite novel, and it may be illustrated and more fully explained on some future occasion. A model of the valve is shown, with a neat arrangement for tracing a diagram of its action. The crosshead of the engine is unusually long, and the connecting rod, instead of vibrating on the pin, is rigidly attached to it, and the pin moves in bearings on the crosshead. This arrangement greatly facilitates accurate adjustment. The crank pin works in cast iron boxes. The main bearings have considerable side play. It would be impossible, without illustration, to give a thorough explanation of the features which have been briefly enumerated. The design in building the engine was to give the students some idea of the requirements of a good engine. The result is a substantial machine, and one which will probably be serviceable as constructed at present, though it will be noticed that some of the details are experimental. It will be easy, however, to use packing, if it should be found necessary. The engine has a diameter of 6 inches and a stroke of 12, can be run at a speed of 300 revolutions a minute, and will be sold for $750.

If any of your readers is looking for a complete foot lathe he will do well to visit this exhibit. The amateur foot lathe made by the students, is the second that has been constructed at their shop, and seems to be as nearly perfect a machine of the kind as is usually met with. It has a 4 foot bed and 10 inch swing. There are three speed wheels for the driving belt, an internal back gear on the head stock, three friction feeds, and change wheels for cutting screws of 26 different pitches. The machine is adapted to all kinds of work that can be done on a lathe, straight and taper work, turning spheres, etc. The slide rest moves on one flat and one V way. There is an adjustment for a slight movement of the tool, such as may be required in screw cutting. One wrench fits all the nuts which must be loosened to make adjustments. Handles are fitted to all parts in which frequent changes are required. The rock shaft of the treadle motion works on knife edges, and requires no lubrication. On removing the foot from the treadle, it becomes detached from the pin of the connecting rod, and is caught and held up by a spring. There are drawers at the back of the machine for the extra wheels and tools. This machine is offered for sale at the very moderate price of $400. It is probable that it will be bought by some amateur who knows how to appreciate work of this kind.

The engine in this exhibit drives a Gramme machine, which has the power of a Grove battery of 100 cells. This machine was built by the students, from designs furnished by the Professor of Physics, and is, so far as the writer knows, the only machine of the kind built in the United States. It furnishes power for several electric engines used by another exhibitor for driving a lathe, a sewing machine, and a mill, also for an electric light, and for burning wire. The machine has several ingenious adjustments or switches by which the direction and quality of the current can be changed, and it can also be used as an electric engine, driven by a battery.

Philadelphia, Pa. R. H. B.

[For the Scientific American.]

THE FACTS OF THE LAWS OF GRAVITATION.

The crucial test for the correctness of a scientific theory is the inquiry whether it will enable us to predict phenomena, and whether experiment or observation will verify every prediction. Recently a member of the French Academy stated that he had conceived a new theory of electricity, and was at once asked if it had enabled him to foresee phenomena, and if he had found practically the verification of his prediction. His answer was affirmative, but not as positively so as strict science requires, and his theory is therefore still an hypothesis.

Among all the scientific theories, there is none more firmly established than that which maintains the universality of gravitation, and establishes the laws governing it. We avoid speaking of a theory of gravitation, because we cannot help considering gravitation as a stubborn fact, and not as a mere speculation. That bodies fall to the ground, and after having falling exert an amount of pressure on their support in proportion to their mass, is a simple, universally recognized fact, without any theory about it; and this is what we call gravitation, which means simply that matter is heavy, and that twice or thrice the mass is twice or thrice as heavy. But the laws which govern gravitation, the universality of its action, and its presence throughout the whole Universe: these form a theory, which is susceptible to proof.

If ever any scientific theory was thoroughly tested, by predictions of phenomena expected under certain circumstances, it is this; and if ever any theory was fortified by the subsequent observation and verification of the predicted phenomena, it is this. It has been attacked in some quarters, even by persons of education, and doubts have been thrown upon its teachings. This was done by the great German poet and philosopher Goethe, among others; but he was simply ignorant of the facts. Every man judges about things according to the amount of information in his possession; and if Goethe had been informed of the manifold facts verifying this theory, he would surely never have attacked it. Unfortunately he did not know anything about mathematics, which is the science of the laws governing space and time, and therefore the key to all natural philosophy; neither had he ever received any training in practical observation and experiment, his large treatise on optics being a gigantic confession of ignorance of the subject, and also of his inability to draw correct conclusions from phenomena observed. He erred equally when treating of gravitation; he showed that he had not the least comprehension of the established theory, forgetting, as he did, that, in order to criticize anything thoroughly and successfully, we must first understand it well. Hence his strictures upon the Newtonian theory go for nothing, and have weight only among those who know as little about it as Goethe did; and their number is, unfortunately, not inconsiderable.

Newton tested his theory by the motion of the moon, and found that, if terrestrial gravitation (which is no theory, but a fact) extended to the moon, and diminished inversely as the square of the distance from the earth's center, it would, as the moon is at a mean distance of 60 terrestrial radii, be 60 x 60 or 3,600 times less in power on the moon. As a body on our earth falls nearly 16 feet in the first second, it would, at the distance of the moon, fall 3,600 times as slowly; and as an hour is 3,600 seconds, it would there fall in an hour no further than near the earth's surface in a second, so that the moon falls every hour 16 feet towards the earth. Comparing with this figure the tendency of the moon to move in a straight line, as is the natural property of all moving bodies, and the moon's consequent tendency to fly off in a straight tangent from its curved orbit, he found that, if terrestrial gravitation or attraction were withdrawn, she would in an hour be 16 feet further from the earth, this centrifugal force appearing exactly to counterbalance the terrestrial attraction at that distance, and proving that it really was 16 feet for the first hour: verifying thus the law that the attraction is inversely proportional to the square of the distance.

That this terrestrial attraction or gravitation was partially counteracted, even on the earth's surface, by the earth's rotation around its axis was proved by the fact that this attraction was stronger near the poles, where the circle of rotation is smaller and the velocity less, and weaker under the equator, where the circle is larger and the velocity greater; while in the latter case the centrifugal tendency is in a direction exactly opposite to that of gravitation, so that bodies weigh more at the poles than near the equator.

That the terrestrial attraction is not a property of the earth, but is diffused throughout all matter, so that all bodies attract all other bodies, was proved by the torsion balance of Coulomb, by which he proved that a heavy mass, suddenly brought before a small ball delicately suspended in a glass case, will attract the latter from its position; he even measured the amount of this attraction for masses of a given weight, and in this way came, by comparison, to the knowledge of the mass of our whole earth.

That the terrestrial gravitation is not concentrated in the earth's center, but a resultant of the sum total of all the individual attractions of every particle contained in it, is proved by the diminished gravitation when descending in a mine. If indeed the attraction solely resided in the center, it should increase when going down; but being a result of the attraction of the whole mass, the central attraction is counteracted by the attraction of all masses above the observer; and hence gravitation decreases with the depth, and if it were possible to reach the earth's center it would be found there to be zero, the attraction being balanced all round.

In Herschel's "Astronomy," published many years ago, an arrangement is suggested for observing the difference in gravitation on the earth's surface, by counteracting it by a force not dependent on gravitation, namely, a spiral steel spring. It is evident that, if we wish to ascertain whether a mass of say 1 lb. in weight, weighs less under the equator than near the poles, we must not use a 1 lb. weight as counterpoise, as this would be equally affected by the terrestrial attraction; but if we use a spring to suspend it from, we shall observe less tension in the spring on which the mass of 1 lb. is suspended when brought to a locality where the gravitation is less, as is the case under the equator, than it is at the poles.

The apparatus suggested by Herschel is but a rough contrivance, and only fit to show that there is a difference, and it is not adapted to measure the amount of this difference. It consists of a stand from which a spiral spring is suspended, to the lower end of which a weight is attached. The weight and spring are so arranged that, when the whole machine is placed perpendicularly, the weight will just touch a piece of glass plate, inserted in the base under it. If now this apparatus is carefully packed up so as not to disturb anything, and transported to a locality where gravitation is less, it will, when set up again, show that the gravitation is not sufficient to draw the weight down until it touches the glass plate.

Siemens has succeeded in constructing an apparatus, founded on this principle, so perfect that he can measure the diminished gravitation with sufficient accuracy to calculate the distance from the earth when in a balloon; and not only this, but, as water is of less density than the earth, he can also calculate from its indications the depth of the ocean. Evidently the gravitation at the ocean's surface must decrease in proportion as the depth increases; because, when there is more water under the ship's bottom (water having less weight than earth) its attraction will be, proportionally to its mass, less. This instrument, which has been described in the SCIENTIFIC AMERICAN SUPPLEMENT (page 368, volume I), is thus constructed in entire accordance with the theory of the law of gravitation; and having been fully verified by experiment, it is an additional confirmation of this theory, of which the ultimate triumph is as complete as that of any theory in the whole field of Science.

New York city. P. H. VANDER WEYDE

[For the Scientific American.]

NICKEL AND ITS PREPARATION.

Nickel is not an abundant metal; and although it occurs in a dozen different ores, the number of localities where it it is found in paying quantities is very few. It is never found in a metallic state, except in meteorites. In ores, it is generally associated with iron and cobalt, both of which it resembles. The principal source of nickel is the native arsenide, a copper-colored mineral, called by the Germans *kupfer-nickel*, or false copper, because it contains no copper. This ore contains from 33 to 55 per cent of arsenic, 33 to 45 per cent of nickel, and small quantities of sulphur, iron, and other substances. Another compound of nickel and arsenic has received the name of cloanthite or white nickel. Annabergite, or nickel bloom, is a compound of arsenic acid with oxide of nickel, quite soft and of an apple green color. The most beautiful nickel mineral is the sulphide, or millerite. It has a brass yellow color and metallic luster, and usually occurs in capillary crystals, in the cavities and among the crystals of other minerals, hence called capillary pyrites In this country it is found chiefly in Lancaster county, Pa. The other nickel minerals are breithauptite, nickel glance, ullmanite, emerald nickel, pyromelin, grunanite, pimelite, garnierite, and nqumeite. Speiss is a deposit formed in the pots in which roasted arsenide of cobalt, mixed with copper nickel, is fused with carbonate of potassium and quartz, for the preparation of smalt, in the blue color works; it collects below the blue glass, in the form of a metallic alloy, the nickel not oxidizing so easily in roasting as the cobalt. It is an important source of nickel

Of the metallurgy of nickel little is known outside of the works, which are carefully guarded, although it is difficult to see of what use a knowledge of a process could be to those who have no source of material at hand, or why those who have a monopoly of the ore need fear competition. Professor C. Küntzel has, however, published some interesting facts in regard to the method used in the metallurgy of nickel, from which we glean the following:

The preparation of metallic nickel and cobalt is sometimes conducted in the dry way, by collecting and concentrating the nickel, cobalt, and copper, in an arsenical or sulphur compound (*speise* or stone), while, at the same time, the iron in the ores is removed by scorification; the cobalt is afterwards fluxed with pure quartz sand, and the protoxide of cobalt precipitated, from the silicate of cobalt thus formed, by fusion with excess of carbonate of soda; the sulphur or arsenic is expelled from the *speise*, which has had the cobalt removed by roasting and heating with soda and saltpeter, and finally reduced with carbon. It is more frequently obtained in the wet way, by dissolving the nickel and cobalt ores in acids and separating the dissolved metals; but the greater part of the iron should first be removed and the nickel and cobalt concentrated before dissolving. In the dry method the first step is also to get rid of the iron in the ore or *speise*. The complete separation of iron from arsenical compounds of nickel and cobalt is not very difficult, for iron has much less affinity for arsenic than cobalt or nickel; but to separate it from the sulphides was, until recently, very difficult, if not impossible. The reason of this is that nickel and cobalt have nearly the same affinity for sulphur that iron has. This operation is now accomplished by smelting the rawferruginous ore in a reverberatory furnace, with a mixture of two parts of fine barytes and one part quartz sand; for 1 per cent of iron, 18 to 19 per cent of this flux is required. A fusible ferro-silicate of barium is formed and sulphurous acid driven out. In 1870, Dr. R. Wagner proposed to make use of the oxidizing action of Chili saltpeter for removing the iron, sulphur, and arsenic. For arsenical products, this method is inferior to the one generally employed, namely, roasting the metallic arsenides after the iron has been removed, then heating with saltpeter and soda. Wagner's method may be employed with advantage when it is desired to smelt a nickel ore, which has been freed from iron, with a metal free from sulphur, provided it contains enough copper to prevent the resulting metal from being too infusible.

The manufacture of nickel in the wet way varies with the material or source. The principal steps are the following: 1. Dissolving the roasted products in hydrochloric or sulphuric acids. 2. Precipitation of the iron by means of lime or carbonate of lime, or soda, after oxidizing, if necessary, with chlorine or chloride of lime. 3. Precipitation of the copper with sulphuretted hydrogen, or alkaline sulphides. 4. Precipitation of the cobalt as sesquioxide by means of chloride of lime. 5. Precipitation of the nickel as hydrated oxide or carbonate with milk of lime or carbonate of soda. 6. Igniting this precipitate so as to obtain anhydrous oxide of nickel, insoluble in dilute acids. 7. Leaching out the excess of lime and gypsum from the ignited oxide of nickel. 8. Reduction of the pure oxide of nickel by ignition with charcoal.

In dissolving nickel ore, care should be taken to prevent silica going into the nickel solution, for, on neutralizing the previously acid solution, all the silica is precipitated in the form of silicate of nickel. Sometimes in analyses a small quantity of silicic acid runs through all the operations, and there is no simpler method of removing it entirely at the start than by adding to the neutral solution some neutral nickel salt.

For precipitating the copper with sulphuretted hydrogen, Gerstenhoefer's precipitating tower, which was first employed at Freiburg to precipitate arsenic from sulphuric acid, may be employed. Such an apparatus avoids any escape of the gas, and precipitates the metals in the shortest possible time. The solution enters automatically at the top of the tower, which has an hydraulic seal. It falls, drop by drop, down into an atmosphere of sulphuretted hydrogen, passing from one platform to another: and if it does not contain too much copper, it passes out at the bottom free from copper. The gas, which is absorbed by the nickel solution, is expelled by heating it with steam. If a soda ash works is near, the waste sulphide of calcium may be employed with profit for precipitating the copper. Injury to the workmen from inhaling sulphuretted hydrogen can be prevented by the use of wine or spirits; sulphuretted hydrogen retards the circulation of the blood, which is neutralized by the property that alcohol has of accelerating the circulation.

Nitrite of potash cannot be employed to separate nickel and cobalt when there is lime in the solution. In this case it cannot even be used as a test; for in the presence of lime or other alkaline earth, a yellow precipitate is formed, similar to the nitrite of cobalt and potash, and said to have the composition $K_2 Ca Ni (NO_2)_6$. If there is enough lime present, all the nickel is thrown down as a double nitrite.

Cobalt and nickel may be separated by means of sulphate of ammonia and sulphuric acid, if the quantity of cobalt is not too small relatively. The separation is quite exact if the solution is sufficiently concentrated. The nickel separates as a difficultly soluble double sulphate of nickel and ammonia, while the double salt of cobalt remains in solution. From the former the sulphate of ammonia is expelled by heating in clay pipes. The sulphate of nickel is almost entirely converted into oxide by roasting with charcoal; the last trace of sulphur is removed by igniting with soda and saltpeter.

The best method of removing the sulphate of lime is to extract the excess of lime added with hydrochloric acid water, then to boil the oxide with steam, and add slowly such a quantity of carbonate of soda that, after boiling a quarter of an hour, there is still an excess of the carbonate in the solution. Sulphate of soda and carbonate of lime are formed; the first is washed out with water, and the latter with water acidified with hydrochloric acid.

Oxide of nickel can be reduced at a bright red heat by simple contact with coarse broken charcoal. The reduction extends inwardly from the surface of the cubes. If left in contact with the carbon after it is entirely reduced, it absorbs more and more carbon. The reduction usually takes place on the clay crucibles on the hearth of a flame furnace. At Val Benoit, near Lüttich, a continuously working furnace is used, the reduction being accomplished in upright tubes. E. J. H.

[For the Scientific American.]

SCIENTIFIC APPARATUS.

At the loan exhibition of scientific apparatus, now open at the South Kensington Museum, London, free evening lectures are delivered on scientific subjects. The collection includes apparatus of the most primitive and ancient forms, with specimens of the successive improvements down to the present time. Many of these articles have a great personal interest, as associated with the names, labors, and discoveries of eminent scientific men, mechanicians, discoverers, and inventors. On a recent occasion, the lecturer, Mr. Chandler Roberts, F.R.S., chemist of the mint, took for his theme: "The Apparatus Employed in the Researches of the late Master of the Mint, Mr. Graham." The name of Thomas Graham is well known as the author of "Elements of Chemistry." His scientific papers, published in the transaction of societies, range in date from 1834 down to 1869, the year of his death

The lecturer, with specimens of apparatus before him, both that of Mr. Graham and of others, gave a very interesting discourse. In its scientific aspects, and in its comparison of the processes followed, the reasoning employed, and the results obtained, the lecture was very interesting. But there is another respect in which the lecture has a general interest, as demonstrating that the essential apparatus for scientific researches is found in the mind, the memory, the power of analysis and comparison, in the ingenious adaptation of means and implements: in a word, in the genius of the discoverer.

Mr. Roberts concluded his lecture by saying that, although for delicate researches or measurements complicated instruments are necessary, still the most ordinary appliances, in the hands of a man of genius, are capable of yielding very important results. With a glass tube and a plug of plaster of Paris, Mr. Graham discovered and verified the law of the diffusion of gases. With a tobacco pipe, he gave additional evidence that atmospheric air is a mechanical mixture of its constituent gases. By the aid of a tambourine and a basin of water, he divided bodies into crystalloids and colloids, and obtained silicic acid, and oxide of iron soluble in water. With a toy balloon of india rubber, filled with carbonic acid gas, he separated oxygen from atmospheric air, and developed points, the importance of which it is impossible to overrate from a physiological point of view. By the expan sion of a wire which attended its absorption of a gas, he did much to prove that hydrogen is the gas of a white metal.

Such facts as these are of great interest to mechanics and operative chemists, whose daily occupation is the proof of mechanical and scientific discoveries, the application of laws and facts already discovered. Their daily employment is suggestive; and if they have active minds and patient habits of observation, there are frequent chances for testing the value of their thoughts and the possibilities of improvements in machinery and processes. "If" they had only such and such tools, or apparatus! The "if" must be met as Thomas Graham met it. *

Liquid Indicator.

Dr. Siemens has designed an instrument by which a stream of alcohol and water mixed in any proportion is measured in such a manner that one train of counter wheels records the volume of the mixed liquor, while a second counter gives a true record of the amount of alcohol contained in it. The principle on which this measuring apparatus acts may be shortly described thus: The volume of liquid is passed through a revolving drum, divided into three compartments by radial divisions, and not dissimilar in appearance to an ordinary wet gas meter; the revolutions of this drum produce a record of the total volume of passing liquid. The liquid, on its way to the measuring drum, passes through a receiver containing a float of thin metal filled with proof spirit, which float is partially supported by means of a carefully adjusted spring, and its position determines that of a lever, the angular position of which causes the alcohol counter to rotate more or less for every revolution of the measuring drum. Thus, if water only passes through the apparatus, the lever in question stands at its lowest position, when the rotation motion of the drum will not be communicated to the alcohol counter; but in proportion as the lever ascends, a greater proportion of the motion of the drum will be communicated to the alcohol counter, and this motion is rendered strictly proportionate to the alcohol contained in the liquid, allowance being made in the instrument for the change of volume due to chemical affinity between the two liquids. Several thousand instruments of this description are employed by the Russian government in controlling the production of spirits in that empire, whereby a large staff of officials is saved, and a perfectly just and technically unobjectionable method is established for levying the excise dues.—*Nature.*

Naval Items.

REDUCTION OF PAY AND MEN.

"Abstract of general order No. 216, dated August 12, 1876: The estimates made for pay of the navy for the current year were $7,600,000. Congress, however, determined that by a very rigid enforcement of a somewhat disused power on the part of the secretary of the navy to furlough officers, instead of having them under the heads of "other duty" or "waiting orders," a very considerable reduction could be made; and appropriated for the current year, for the pay of the navy to be administered upon this plan, and also reduced by cutting off 1,000 from its former complement of 8,500 men, the sum of $5,750,000, or nearly $2,000,000 less than the amount of the estimates. Under these circumstances, the department, although entertaining different views, feels bound to make, in good faith, the effort to bring the actual expenses of this branch of the service as near as possible to the amount appropriated by Congress. This can only be done by reducing the number of officers employed, to those absolutely needed to meet the daily pressing requirements of the service, and by putting those unemployed upon the lowest pay recognized by the provisions of existing laws.

"It is therefore ordered that: Until further orders, all officers not on duty on September 1 next, and all on leave, will, at the expiration of leave or waiting orders, be regarded as on furlough, and will be so paid.

"The foregoing applies only to the active list of the navy, the pay of retired officers being fixed by special provision of law."

NAVAL ENGINEER CORPS GAZETTE.

Chief Engineer James B. Kimball, detached from the U. S. steamer Hartford, and as Fleet Engineer of the North Atlantic Station, and placed on waiting orders.

Chief Engineer A. J. Kiersted, detached from the U. S. steamer Vandalia, and ordered to the Hartford, and also to dischsrge the duties of Fleet Engineer of the North Atlantic Station.

Chief Engineer Joseph Trilley to the Vandalia.

Cadet Engineer George S. Willits, detached from the Vandalia and placed on waiting orders.

A Panic among Sponge Divers.

Mr. Vice-Consul Jago, writing from Beyrout, says that the last crop of Turkey sponge was very deficient, and prices of ordinary and common sponges have greatly risen in consequence. The deficiency is attributed to a panic among the divers, caused by the appearance in the neighborhood of Batroun, Mount Lebanon, the chief sponge fishing locality, of a sea monster, alleged to have been equal in size to a small boat. Its actual depredations among the divers appear at the present time to have been limited to one man, whom he is said to have swallowed whole.

A SQUARE of 208·72 feet each way covers one acre, so also does a circle 235·5 feet in diameter.