The New Navy.

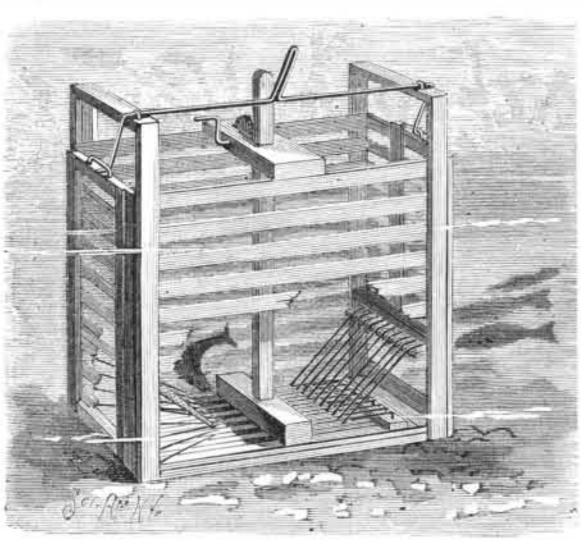
An interesting account of the new American navy is embodied in the annual report of the American Iron and Steel Association. All the vessels for the new navy, except five partly completed iron monitors, are or will be built of steel. After long delay the completion of these monitors has recently been authorized. Their keels were laid in 1874 and 1875. They are armored and double-turreted. Each monitor is to have four 10-inch breech-loading rifled guns in its main battery and several rapid-fire and Gatling guns in its secondary battery. The guns of the main batteries are all breech-loading rifles. Besides the main batteries, each vessel will be equipped with a secondary battery, which in nearly every ship will consist of several small rapid-fire guns, from 6-pounders down, revolving cannon, and from two to four Gatling guns. The vessels recently built or now building are:

Vessel.	Type.	Displacement. Tons.	Main Battery.
Texas	Belted	6,300	2 12-inch.
			6 6-inch.
Maine	Belted	6,648	4 10-inch.
			6 6-inch.
Chicago	Cruiser	4,500	4 8-inch.
			8 6-inch.
			2 5-inch.
Boston	Cruiser	3,189	2 8-inch.
			6 6-inch.
Atlanta	Cruiser	3,189	2 8-inch.
			6 6-inch.
Dolphin	Dispatch	1,485	1 6-inch.
Newark	Cruiser	4,083	12 6-inch.
Charleston	Cruiser	3,730	2 8-inch.
			6 6-inch.
Baltimore	Cruiser	4,413	4 8-inch.
			6 6-inch.
Philadelphia	Cruiser	4,324	12 6-inch.
San Francisco	Cruiser	4,083	12 6-inch.
Yorktown	Gunboat	1,700	6 6-inch.
Petrel	Gunboat	890	4 6-inch.
Concord	Gunboat	1,700	6 6-inch.
Bennington	Gunboat	1,700	6 6-inch.
Vesuvius	Cruiser	725	3 15-inch dynamite guns.
First class torpedo boat	Torpedo	99	8 automobile torpedoes.

The Texas has an armor 12 inches thick and the Maine one 11 inches thick. The other ships are unarmored. The building of a coast defense vessel of 4,000 tons displacement, four additional steel cruisers, and three gunboats has been authorized by Congress. When all the vessels enumerated above shall have been completed, the United States will have a navy of thirty-six iron and steel vessels, all, excepting the five monitors, built on the most approved modern plans. This fleet will consist of eighteen cruisers (including two dynamite cruisers and a cruising monitor), one dispatch vessel, six gunboats, one torpedo boat, seven coast or harbor defense vessels (including the five monitors), two line-of-battle ships, and one training ship. Eleven ships of the fleet, including the monitors and two of the cruisers, will be armorclad.

AN IMPROVED FISH TRAP.

The accompanying illustration represents a fish trap recently patented by Mr. Elijah W. Jenkins, of Milford, Mo. The frame has slatted side walls and a central cross piece, while in the corner post are held vertically movable slatted end walls, connected to the arms of a rod, the center of which is bent to form a lever, by pressing down upon which the end walls may be elevated to permit the entrance of the fish. Wires are hinged to the inside of the frame in such way that the



JENKINS' FISH TRAP.

fish may swim into the trap under the wires, when the wires will drop down and prevent the escape of the fish. Wire netting and converging wires are also provided on the inside of the frame to prevent the fish from swimming through the trap. To the central cross piece of a false bottom of the trap is pivoted a vertical rack bar, passing up through the upper cross piece, on which is a gear wheel secured upon a crank shaft, by turning which the false bottom and also the two end frames may be drawn up, the slatted end walls being at such time lowered to prevent the escape of the fish. For further information address Mr. G. B. Peter, agent, Milford, Mo.

THE TOTAL ECLIPSE OF THE SUN AT LICK OBSERVATORY.

Professor Holden, Director of the Lick Observatory, is preparing an elaborate report upon the result of the observations made during the total eclipse of the sun in the latter part of last January. This will be looked for with special interest. We have been fortunate enough to procure one of the photographic negatives made at that time, which we reproduce by photo-engraving process. It is printed as a positive in order that the form and extent of the sun's corona may be represented in black, thus defining more clearly the delicate penciling of the rays of the corona. In a letter published in the San Francisco *Call*, Professor Holden says:

"The first result of the photographs has been to show that the characteristic forms of the solar corona vary every eleven years, as the sun spots and the exhibitions of the aurora borealis vary in frequency. Besides this capital conclusion, the photographs enable us to conclude that the so-called polar rays of the corona can be traced all round the sun's circumference, even at the equator, and thus that we must consider these polar rays (so called) as a special typical form, quite different from the other class of rays which they resemble in appearance, but which are only to be found associated with the equatorial wings and extensions of the outer corona.

ECLIPSE OF THE SUN IN CALIFORNIA.

"So far as I know, no photograph of the corona has traced these wings further from the center than fifty minutes of arc. Out to that distance they seem to be convergent and to indicate that they quickly come to an end. Mr. Barnard's photographs, however, show faint extensions as far out as seventy-five minutes of arc, and it is evident that the outer corona, instead of quickly terminating, must extend far into space. The pictures show this divergent outer extension in a form like that of a fan, or like the open mouth of a trumpet. This, of course, indicates that the outer corona is in the shape of a huge disk, surrounding the whole sun, with its outer rim much deeper than its inner one. In fact, if the sun were surrounded by a ring of meteorites, the appearances would be much the same as in the photographs." In two photographs the outer corona is distinctly defined as far out as the 95' circle, and may be indistinctly traced as far as 135 to 165 minutes respectively.

War Ships Launched in 1888.

According to a careful estimate, the number of war vessels launched last year by the naval powers of the world was 60, while more than 100 were building when it closed. England led, with 15 vessels launched and 28 building; France launched 9, and laid down 15; Russia launched 2, and began 10; Germany put 6 vessels into the water, and ordered or laid down 4; Italy launched 10, and laid down 18; Austria launched no vessel, but laid down or ordered 3; Sweden laid down 1; Denmark launched 1, and laid down another; China added 4 vessels to her navy, and ordered or laid down 4 more; Japan ordered 3, and launched 3; the United States launched 6, and laid down 6; Chili ordered a new cruiser in England, and the Argentine Republic contracted for a 4,300 ton ironclad; Brazil laid down a cruiser, and even Uruguay has contributed to the navies of the world, launching a small iron gunboat. The minor powers, like Greece and Portugal, have either contracted for or launched small vessels. Turkey has begun the work of building up her navy, laying down one ironclad and several smaller vessels.

Increasing Longevity.

Dr. Todd, president of the Georgia State Medical Society, read at the annual meeting of that body, held at Atlanta recently, a paper on "Longevity," which possesses great intrinsic interest and at the same time is gratifying as showing how much medical and sanitary science and a more rational mode of life have done to prolong the human span, and how much better in every way are the conditions of to-day than of those "good old times" for the return of which sentimentalists vainly sigh. The doctor is modest in his claims, making no effort to monopolize in the name of the medical profession credit for a betterment in which so many agencies play parts; but he does claim, and with reason, that the intelligent physician has had much to do with the result, and that the death rate of the various peoples of the globe bears a ratio very nearly inverse to the number of qualified physicians among them. The highest death rate in Europe is that of Russia, ranging from 20 per thousand in Courland and 22 per thousand in the Baltic province, there being many physicians in both districts, to 49 in places where there are but few. But one-half of the children born in some parts of Russia reach the seventh year, and of 1,000 male children only from 480 to 490 reach the age of 21 years, and of these only 375 are able-bodied. Russia, with all its teeming population, has only 15,414 regular physicians, and one surgeon to 100,000 population. The United States, having a doctor of medicine for every 600 population, shows the lowest death rate in the world, England following. The average life expectancy in the United States is now 55 years; in England among the urban population it is 50, and among the ruralists 54 years plus. Russians have a life expectancy of but 28 years, approximately, and Chilians of the same, while in Ellobed, in the Soudan, 23 years is a generation. The average life in the Rome of the Cæsars was 18 years; now it is 40 years. Within fifty years the average in France has increased from 28 to 45½ years, and in the days of Queen Elizabeth the English average was but 20 years. Dr. Todd ascribes the great and progressive change for the better to advanced medical knowledge, better drainage and diet, greater cleanliness, and to vaccination and the use of anæsthetics, quinine, and the like. He thinks that quinine alone has added two years to the average life of civilized man. To these agencies should be added the decrease of war, the more lenient laws, and the greater temperance of our day.—*Detroit Free Press.*

A Partnership Birds' Nest.

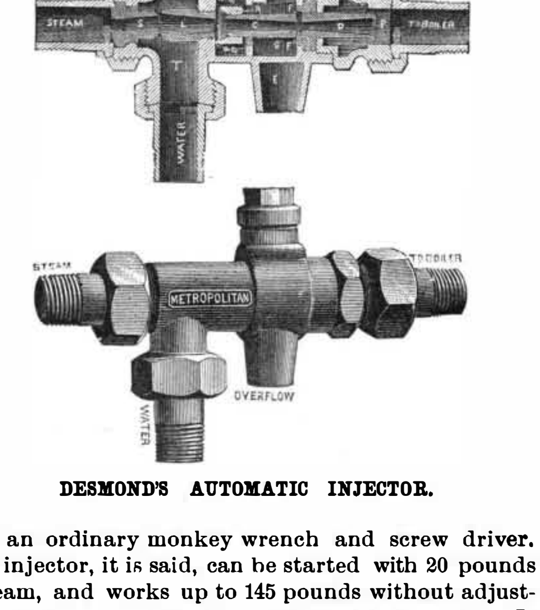
Mr. W. E. Beale writes from Folkington Manor to the *Times:* "On this estate is to be seen a nest which has evidently been built partly by a thrush and partly by a hedge sparrow. The nest itself is of the ordinary size of the thrush's nest. But instead of being lined with mud, it is lined with horsehair, wool, and moss. The birds seem to have been good friends during the laying of their eggs. Recently there were three sparrow's eggs in the nest and five thrush's. But on visiting the nest later, it was found that the sparrow's eggs had been destroyed. The birds appear to have quarreled when it came to the question of which should sit on them, and the thrush asserted its rights, not, however, without a struggle on the part of the sparrow, one of the thrush's eggs being broken, one missing, and three being perfect."

Woman's Place in Nature.

Mr. Grant Allen propounds in *The Forum* a new view of "Woman's Place in Nature." "The males," he says "are the race; the females are merely the sex told off to recruit and produce it. All that is distinctively human is man—the field, the ship, the mine, the workshop; all that is truly woman is merely reproductive—the home, the nursery, the schoolroom." "This very necessity for telling off at least a considerable number of the women for the arduous duties of human maternity prevents the possibility of woman, as such, ever being really in any deep sense the race. It is human to till, to build, to navigate, to manufacture; and these are the functions that fall upon man." "The males have built up human civilization and have made the great functionally acquired gains in human faculty, while the females have acted as mere passive transmitters of these male acquisitions."

AN IMPROVED AUTOMATIC INJECTOR.

An injector which is exceedingly simple in operation, and designed for use on any kind of boiler, is shown in the accompanying illustration. In operation it should always be placed in horizontal position, as shown, and the steam and suction pipes supplied with globe valves. Its construction and operation will be readily understood from the sectional view. When an examination of the parts is necessary, it can be readily taken apart



DESMOND'S AUTOMATIC INJECTOR.

with an ordinary monkey wrench and screw driver. This injector, it is said, can be started with 20 pounds of steam, and works up to 145 pounds without adjustment, it being adapted to work up to 200 pounds. It is claimed that a hot suction pipe will not prevent the injector from starting readily, and that severe jarring will not affect its working, its automatic qualities restarting it if the feed is temporarily stopped. This injector was invented and perfected by John Desmond, and is manufactured for Messrs. Jenkins Brothers, 71 John Street, New York City.

Air Compressor Lubrication.

Our attention is called to the importance of care in the selection of lubricators for air compressing plant, by a paper recently read before the North of England Institute of Mining and Mechanical Engineers by Mr. Morison. In recent years in England there have been two explosions of receivers of compressed air, which undoubtedly occurred from the ignition of vapor from the oil used in lubrication, and a third case where the excessive heat in the pipe indicated that ignition had commenced, and an explosion was no doubt only avoided by this discovery before the vapor generated from oil collected in the receiver came in contact with the actual ignition. There were also, at least, one if not two cases of fire at the works on the Croton Aqueduct traceable to the same cause.

The first of these accidents referred to is described as follows: The air compressor supplying the receiver in question was working at a pressure of 57 pounds per square inch, and the receiver consisted of a cylindrical shell with hemispherical ends, the shell being 29 feet long and 6 feet in diameter. The receiver was close to the air compressor. On the night of the accident the attendant had oiled the air cylinders shortly before the explosion occurred. The explosion was accompanied by a loud report, and a large volume of flame was observed to shoot upward and shortly subside, but left some oily matter inside the receiver burning. The flashing point of the oil used here was discovered by the committee appointed to examine into the circumstances to be 365° F.

The conditions of the other explosion were similar to the first, and in the third case referred to, the flashing point of the larger part of the oil was found to be 295° F., and it was found to be a mixture of thickened cottonseed oil, heavy mineral and light mineral oils. The heavy mineral oil by itself had a flashing point of over 480° F., and was therefore safe if used alone. In this case the receiver was distant from the compressor, and the excessive heat arising from the ignition of the oil collected in the pipe was fortunately discovered where the volume of air was too great to allow of an explosion and before it had traveled to the receiver. The pipe was 6 inches inside diameter, of cast iron, with flanged joints, the joint being made with India-rubber insertion screwed up between the flanges. The receiver was 50 feet from the compressor, and the air compressed to 50 pounds per square inch. The temperature of the air leaving the compressor, when used up to 50 pounds per square inch, was found to be from 320° to 370° F. Two of the pipe joints between the compressor and receiver began to blow, and sparks were blown out, and the pipe in the vicinity of the joints was found to be nearly red hot, and on subsequent examination a charred deposit was found inside the pipe, being the residue of the lubricating oil. The point of ignition of these oils, or, rather, the vapor from them, was apparently not ascertained, and in this respect the report of the committee appointed seems strangely deficient.

There are, however, some very distinct conclusions to be drawn, and which may be laid down as rules which are no doubt attended to by careful users of compressing plant, but which should be adhered to by all. The air receiver should be blown off daily to prevent accumulation of oil in such quantity as to generate a dangerous volume of vapor, and more important still, only pure lard oil, or such special lubricator as is supplied by responsible firms for the express purpose, should be used, and if there is the slightest doubt as to the quality of the article supplied, its flashing and ignition points should be ascertained.—*Eng. and Min. Journal.*

Brains in Business.

One great secret of success in business—the secret, in fact, of success on a large scale—is to conceive of it as a matter of principles, not merely as a series of transactions. There are great merchants as there are great statesmen, and there are small merchants as there are small politicians, and the difference between the great and the small men is very much the same in both professions. The small politician works by the day, and sees only the one small opportunity before him, the small merchant does the same thing—he is looking for the next dollar. The statesman, on the other hand, is master of the situation because he understands the general principles which control events; this knowledge enables him to deal with large questions and to shape the future. The great merchant does the same thing, his business is not a mere money-getting affair, not a mere matter of barter, but a science and an art, he studies the general laws of trade, watches the general conditions of the country, investigates present needs, foresees future wants, and adapts his business to the broad conditions of his time and place. He puts as much brains into his work as does the statesman, and he ends by being, not a money getter, but a large minded and capable man. An eminently successful business man, of the statesmanlike quality, said the other day that the more he understood of life, the more clearly he saw that it was all done on business principles. By which he meant, not only that the universe stands for the dollar, but that the universe is governed by unvarying laws, that promptness, exactness, thoroughness, and honesty are wrought into its very fiber. On these business principles all life is conducted—if not by men, at least by that Power which is behind man. It ought to be the ambition of every young man to treat his business from the point of view of the statesman, and not from that of the politician.—*The Christian Union.*

Quartz as an Insulator.

Mr. C. V. Boys lately read a note before the London Physical Society. He stated that when making quartz fibers by the process described by him some time ago of shooting an arrow carrying with it a kind of tail of softened quartz, he had observed that, when the fibers were very fine, if they broke off between the bow and the target the extremities assumed the form of a screw about half an inch in diameter and some eight or ten inches long. If any body were brought near this screw, the end of it would shoot out toward the surface of the body, retracting again when the body was removed. It hardly appeared possible that this could be due to any other cause than to the fiber becoming in some manner electrified during its formation. If, however, this were the case, it would show that quartz must be an exceptionally good insulator under ordinary atmospheric conditions, for otherwise the extremely minute charge which could be carried on so fine a fiber would be dissipated almost as soon as it was generated. It was, of course, quite impossible to obtain any direct proof of the existence of so small a charge beyond that given by the behavior of the screw when any substance was brought near to it. He therefore determined to test the insulating power of quartz under ordinary atmospheric conditions, and he found that quartz is under any circumstances a better insulator than glass, and that under the ordinary atmospheric conditions there was no comparison between them. This was very well shown in an experiment which Mr. Boys exhibited to the society. A pair of gold leaves had been suspended by means of a hook formed out of a thick quartz fiber, inside a case with glass ends, and had been electrified about five hours before the time of meeting. In order to make the conditions as unfavorable as possible, the air within the case was kept moist by placing a glass dish full of water inside it, and the quartz hook was made very short. When the experiment was exhibited, the deflection of the gold leaves had only diminished by about one-fourth of its original amount. If glass had been used as a support for the leaves, the electrification would have been entirely dissipated in considerably less than a minute.

Straightening Walls of Buildings.

D. LARDNER.

The weight of the roof of the large gallery of the Conservatoire des Arts et Metiers pressed the sides outward so as to endanger the building; and it was requisite to find means by which the wall should be propped so as to sustain the roof. M. Molard contrived the following ingenious plan for the purpose. A series of strong iron bars were carried across the building from wall to wall, passing through holes in the walls, and were secured by nuts on the outside. In this state they would have been sufficient to have prevented the further separation of the walls by the weight of the roof, but it was desirable to restore the walls to their original state by drawing them together. This was effected in the following manner: Alternate bars were heated by lamps fixed beneath them. They expanded; and consequently the nuts, which were previously in contact with the walls, were no longer so. These nuts were then screwed up so as to be again in close contact with the walls. The lamps were withdrawn, and the bars allowed to cool. In cooling they gradually contracted, and resumed their former dimensions; consequently the nuts, pressing against the walls, drew them together through a space equal to that through which they had been screwed up. Meanwhile the intermediate bars were heated and expanded, and the nuts screwed up as before. The lamps being again withdrawn, they contracted in cooling, and the walls were further drawn together. This process was continually repeated, until at length the walls were restored to their perpendicular position. The gallery may still be seen with the bars extending across it, and binding together its walls.—*The Architect, London.*

A Great Well in California.

M. R. Rose, of the Capital Iron Works, of this city, has bored a well on R. D. Stephen's place, near Mayhew Station, which is the largest in this section of the State. It is 32 inches in diameter and 120 feet in depth. It is not only the largest bored well in the State, but it furnishes more water than any other. In fact, it is an inexhaustible reservoir that cannot be lowered. A sixty horse power engine works a large centrifugal pump, that throws over 32,000,000 gallons per day—more than our city water works pumps in a whole week, and what would measure in a ditch or canal over 1,000 miner's inches. So strong is the supply that this immense volume does not in the least lower the source of supply, and the water is as clear and pure as any obtainable.—*Sacramento (Cal.) Record-Union.*

American Wood Engraving.

BY R. E. M. SUYERKROP.

English and Scotch manufacturers of machinery are beginning to find out that (notwithstanding their proverbial prejudice to many things American) their catalogues can best be illustrated on this side of the Atlantic, and many firms are now not only getting the engraving done in this country, but also the printing.

Printers and engravers across the water are slow to adopt new methods, thinking that "good enough" will do. "What was good enough for our fathers and grandfathers is quite good enough for us," they say. But it is not the man who does the work alone that must be pleased—it is the person for whom the work is done. They are too shortsighted to see this, and rather than move out of the rut they have been taught in, and try and improve their work by the adoption of machines and other modern appliances, they allow the work to slip from their hands to take a journey of 3,000 miles and back.

An English wood engraver as a rule is a mere machine, copying or cutting literally what is drawn for him on the block by a draughtsman, the American method of engraving from a photo. direct on the wood being almost unknown to them. No photograph of a piece of machinery, however well lighted, would look well as an engraving if copied literally. Lights must be taken out, solid blacks put in, and the whole must be actually redrawn, as far as the shading is concerned, with the graver. Therein lies the skill of the American engraver. Although the photo. is flat and devoid of correct light and shade, the final print from the finished cut will be bright, clear cut, and sharp, with a sparkle and snap to it that is not excelled even by work cut from the most finished drawing on wood.

One has only to compare the cuts in foreign machine catalogues with those of our own to see how far they are behind us in the matter of engraving machinery. Examine the shading of the one, and the lines will be found uneven and broken, devoid of contrast and that fineness and even quality so peculiar to work of the other, which is invariably ruled by machine. The ruling machine is a most delicate piece of mechanism, capable of making lines so fine that they cannot be counted without the aid of a strong magnifying glass, making straight, circular, wave, and perspective lines with absolute precision, that could not possibly be cut by hand. Improvements in the art of photography of late years have done much to assist the engraver in his work. Fifteen years ago engravers had to cut through a thick film of albumen on the surface of the wood, put there to prevent the nitrate of silver from sinking into the block. This film or coating would chip and peel off, making the lines ragged and uneven, causing no end of trouble to the electrotyper and printer.

It was due to the genius of Mr. J. M. Blake, of New Haven, to overcome this difficulty by an invention of his own. Mr. Blake made a positive on glass by the old collodion process. This film he floated off the glass silver side down, on the block, afterward dissolving off the collodion with alcohol and ether, leaving a fine, clear print on the wood that offered no resistance to the point of the graver. Since this valuable discovery engravers have been little troubled with bad photos. on wood.

Every engraver should have a camera and know how to use it, as few professional photographers can make negatives suited to the requirements of the engraver, and it is also a great aid to be able to draw. One who can draw well rarely makes a mistake in his cutting and can easily cut from a photo., while on the other hand if unable to draw he must rely on a draughtsman to retouch his photo. on the block or engrave from drawings altogether. It is impossible to draw a line with a pen as clean and sharp as it can be cut. This fact has in a great measure prevented wood engraving, especially of machinery, from being superseded by the various photo-mechanical and chemical methods of reproducing, for it is a misnomer to call them engraving. Every line must be drawn and be absolutely black, and all the spaces between the lines must be pure white in order that a perfect negative may be obtained. This drawing alone often takes more time than to engrave the same on wood, and when finished must go through many intricate processes before the final plate is ready for the printer.

Photo-reproduction of course has its uses, but will never supersede wood engraving for machinery. This no one knows better than the printer. Imitation is the sincerest form of flattery. The Germans have to a great extent abandoned the old laborious method of cross hatching and putting in useless, meaningless lines. Many of their illustrated periodicals have taken up the American style in landscape, figure, and portrait work, but they and their brethren on the little isle to the north have still much to learn from us in the way of mechanical work, and it will take much study and many a long day of constant application ere they can begin to equal us in this line.—*Practical Mechanic.*