would not only be sufficient to melt the whole earth, but to actually volatilize it into thenebulousstate again; nay, it would be sufficient to volatilize six worlds as large as that which we occupy. I am prepared to show you some wonderful experiments with the spheroidal condition, but I have not time, and I will close this already too long lecture with a single illustration more.

There is an erroneous idea that steam-boiler explosions are produced by the formation of a certain gas. The only gas is steam, and it is only because there is too much steam. There is often too much steam because there is too little water; and also owing to the fact that when water comes into contact with superheated surfaces of iron it is suddenly converted with great violence into steam, sufficiently powerful to tear the strongest metals. Chemists utterly deny that there is any foundation whatever for the popular notion among mechanics that there is produced, in cases of explosions of steam-boilers, a kind of gas.

The lecture of Professor Silliman was illustrated by a great variety of experiments, many of which were received with much applause.

FACTS CONCERNING THE FINANCIAL CONDITION OF THE SOUTH.

The following facts concerning the financial condition of the South were furnished to us by the manager of a leading journal, published at Mobile, and are doubtless substantially correct.

During the war, and while Confederate currency was abundant, the planters entirely paid up their debts.

For the two years subsequent to the war, but little capital was embarked in trade in the South, and hence but little credit could be extended to the planters, and they were forced to work through, economically, with the little specie currency they quite generally had stored away. That they might live within themselves, the attention of planters was largely directed to the growth of breadstuffs and meats, and more corn, wheat, and bacon were made in the South than ever before.

During this present year a fair crop of cotton has been made, and generally made with provisions and feed of home growth, so that the planter has received but small advances and is not now in debt. From the high price of our staple—cotton—more money will be distributed in the South this year than ever before, not excepting the year of the great crop—1860.

This year's cotton crop will net the planters of the South the immense sum of *two hundred and fifty million dollars*.

The crop of Mobile alone will bring not less than *thirty million dollars* to be distributed from that point.

The entire debt of the South, abroad, and in the North and West, is less than fifty million dollars.

The vast sum of more than *two hundred million dollars* will be loose money in circulation in the Cotton States.

The restoration of political quiet, following the determination of the Presidential election, will cause a confident free use, circulation, and expenditure of all this currency. In the old time the planter in the South used the gains of each year (in fact was generally a year ahead in debt to his factor) in the purchase of more negroes or more lands, and hence had but little or no money to expend for luxuries and the merchandise of trade.

Now there are no negroes to buy.

The principle of small and well cultivated plantations is accepted, and no planter wishes to buy more land.

The gains of the planter will now be invested in the purchase of improved farm implements, household furniture, articles of comfort and luxury, dry goods, clothing, books, sewing machines, pianos, and other musical instruments, etc., etc.

The trade of the South will now be an exceedingly rich one. While the great West is now undergoing hard times incident to the low prices of breadstuffs, the South will be prosperous in the wealth of her staple, now bringing the most profitable prices.

No part of the country to-day offers a richer field for the enterprising merchant and manufacturer than the Cotton States. These views are plain and simple, and will present themselves with force to every shrewd observer and thinking man.

The man who sees this condition of things aright, and takes immediate advantage by placing himself before the people of the South with his business properly advertised, cannot fail to secure a lucrative trade and large returns of profits for his expenditures.

The Great Floating Dock for Bermuda.

This enormous maritime structure is now completed. The following is a concise history and description of the gigantic undertaking:

The British government, being impressed with the absolute necessity of providing dock accommodations for the iron-clad ships and other vessels constituting the North American and West India squadron, determined some time since to build a capacious floating dock of iron for service at Bermuda. When Admiral Sir Alexander Milne commanded on that station he pointed out to the Admiralty this great want. During the past ten years many iron-clads have been added to our fleet; and although most of these have been payed below water line with various compositions, the hulls of most ships after service afloat were exceedingly foul. The iron men of war on the North American and West India stations were no exception, but after a shorter or longer time afloat were more or less covered below water-line with barnacles, weeds, and parasites, thus impeding the speed of the vessel and causing other annoyances.

The want of a dock in the West Indies, in which a ship could be laid up for cleaning the bottom and for necessary repairs, induced the government to construct a monster floating machine at a cost of nearly £250,000. This dock was built by Messrs. Campbell, Johnson & Co. of the Albert Works, Silvertown, from plans patented by Mr. Campbell, and adopted for the Royal dockyard at Bermuda by Colonel Clarke, R. E. the government director of works. This great iron floating structure, the largest in the world, is of the following dimensions: Extreme length, 381 feet; width inside, 83 feet 9 inches; width over all, 123 feet 9 inches; depth, 74 feet 5 inches. The weight of the dock is 8,350 tuns, and it is asserted that a vessel weighing 10,000 tuns or more may be easily lifted, making the total approximate displacement about 19,000 tuns.

The dock is U-shaped, and the section throughout is similar. The iron-clad Bellerophon, and ships of similar and of smaller size, may be easily received into this capacious hollow, and when once the dock is in position ships forming the squadron on the West Indian station will no longer be subject to great and ever-recurring inconvenience. It is built with two skins fore and aft, at a distance of 20 feet apart. The plans show that the space between the skins is divided by a watertight bulk-head, running with the middle line the entire length of the dock, each half being divided into three chambers by like bulk-heads. The three chambers are respectively named "load," "balance" and "air" compartments. The first-nameb chamber is pumped full in eight hours when a ship is about to be docked, and the dock is thus sunk below the level of the horizontal bulk-heads which divide the other two chambers. Water sufficient to sink the structure low enough to admit a vessel entering is forced into the balance chambers by means of valves in the external skin. The next operation is to place and secure the caissons and eject the water from the "load" chamber. Then the dock with the vessel in it rises, the water in the dock being allowed to decrease by opening the sluices in the caissons. The dock is "trimmed" by letting the water out of the "balance" chamber into the structure itself. The inside of the dock is cleared of water by valves in the skin, and it is left to dry. When it becomes necessary to undock the vessel the valves in the external skins of the "balance" chamber are opened in order to fill them, and the culverts in the caissons are also opened, and the dock sunk to a given depth. From keel to gunwale nine main water-tight ribs extend, further dividing the distance between the two skins into eight compartments. Thus there are altogether 48 water-tight divisions. Frames made of strong plates and angle iron strengthen the skins between the main ribs. Four steam engines and pumps on each side—each pump has two suctions, emptying a division of an "air" chamber—are fitted to the dock, and these also fill a division of the "load" chamber. When it becomes necessary to clean, paint, or repair the bottom of the dock it is careened by the weight of water in the load chambers of one side, and the middle line is raised about five feet out of the water. This gigantic structure is a splendid specimen of workmanship; and, although intrinsically ugly, the skillful toil of the artisan for two years is manifest in the *tout ensemble* of the first great floating dock ever put together in England.

Two other vessels of this kind, have, we believe, been built and sent abroad—one to Cadiz and another to Callao—in pieces; but this is the only dock fitted in this country ready for transport in a complete condition.

The question has been asked whether it would not have been judicious to construct an ordinary dock at Bermuda; but when it is remembered that the island itself is only a coral reef, and that no good foundation can be got, the answer is directly given to this query. Then arises a surmise whether such a leviathan machine could successfully encounter bad weather in the high seas. There is no reason to suppose that the dock would founder, because it can be made as tight as a bottle; and should it get in the trough of a heavy sea, end on, the water would enter at one end and flow from the other. It would, in fact, live on the wave like a well corked bottle. The vessels towing it out would have to keep its head to the gale, and avoid collision; then there would be no risk and little danger.

The Bermuda dock has an enormous rudder, and this has lately been increased considerably in area at the after-end by a large number of planks, in order to give more steerage power. Its cutwaters are formed like the bows of a barge, to divide the water, and by that means diminish the resistance, and enable the dock to be more easily towed."—*London Scientific Review.*

Interesting Planetary Discoveries.

The planet Mars is the only object in the whole heavens which is known to exhibit features similar to those of our own earth, and the accumulated explorations and discoveries of astronomers during the last two hundred years have resulted in the construction of a globe representing the characteristics of this planet as astronomers believe them to exist. At a recent meeting of the Astronomical Society of England, a globe of Mars was exhibited, on which lands and seas were depicted as upon an ordinary terrestrial globe. By far the larger portion of these lands and seas were laid down as well known entities, respecting which no more doubt is felt among astronomers than is felt by geographers concerning the oceans of our own globe. An interesting description of this globe appears in *Fraser's Magazine*. To the lands and seas, developed in the planet, are applied the names of those astronomers whose researches have added to our knowledge on the subject. Each pole of Mars, it seems, is capped with ice, which varies in extent according to the progress of the seasons. Around each cap is a polar sea, the northern sea being termed the Schroter Sea; the southern, Phillips Sea. The equatorial regions of Mars are mainly occupied by extensive continents, four in number, and named Dawes Continent, Madley Continent, Secchi Continent, Herschel I (Sir W.) Continent. Between Dawes and Herschel Continents flows a sea shaped like an hour glass, called Kaiser Sea, the large southern ocean out of which it flows being denominated Dawes Ocean. Between Madler and Dawes continents flows Dawes Straits, connecting a large southern ocean and a northern sea, named after Tycho Herschel continent is separated from Secchi continent by Higgins inlet, flowing from a large southern sea, termed Maraldi Sea. In like manner Bessel inlet, flowing out of Airey Sea (a northern sea) separates the Madler and Secchi continents. Dawes Ocean is separated into four large seas, and large tracts of land lie between, but whether they are islands or not is not certain. In Delarue Ocean there is a small island, which presents so bright and glittering an aspect as to suggest the probability of its being usually snow-covered. These seas, separated by lands of doubtful extent, reach from Delarue Ocean to the south pole.

One of the most singular features of Mars is the prevalence of long and winding inlets and bottle-necked seas. These features are wholly distinct from anything on our earth. For instance, Higgins inlet is a long, forked stream, extending for about three thousand miles. Blesse inlet is nearly as long, and Nesmith inlet still more remarkable in its form. On our earth, the oceans are three times as extensive as the continents. On Mars, a very different arrangement prevails. In the first place, there is little disparity between the extent of oceans and continents, and then these are mixed up in the most complex manner. A traveler, by either land or water, can visit almost every quarter of the planet without leaving the element in which he began his journeyings. If he chooses to go by water he could journey for upward of thirty thousand miles, always in sight of land—generally with land on both sides—in such intricate labarynthine fashion are the land and seas of Mars intertwined.—*Boston Journal.*

Vesuvius on the Rampage.

A correspondent of the *Pall Mall Gazette* has been to look at Vesuvius, to see for himself what the eruption of a volcano is like. He finds it sufficiently terrible. He went up the mountain and stood upon the lip of the crater, and peeped into the roaring abyss on one side, taking advantage of a strong wind that was driving all the suffocating steam and vapor to the other. Presently the eruption came:

It does not consist, as the pictures necessarily lead one to suppose, of a continuous shower at all. Still less does it consist of a continuous shower of black ashes shot out from a fire blazing on the top of the mountain; it is rather a series of explosions. But the roar and glare of the great abyss is continuous. You look into the pit, and though you see no actual flame, yet its sides are in a state of constant incandescence; from the mouth of it there roars up incessantly a dense cloud of steam; and in the depths of it below you hear the noise of preparation for the outburst that is next to come. Then you hear a sharper crackel, and then, without further warning, follows a loud explosion, which shoots into the air a torrent of white-hot missiles of every shape and size. So enormous are the forces at work, that not only small pieces of stone and sulphur, such as you might carry away as mementos of your visit, but huge blocks of mineral, each enough to load a railway ballast wagon, and all in a state of perfectly white heat, are tossed up as though they were so many cricket balls. The explosion lasts, perhaps, no longer than a minute; and then there is a cessation of some seconds, with the noise only of internal preparation once more, after which the explosion is repeated.

Printing in Colors. A Step in Advance.

We have before us a copy of a new illustrated weekly, the *Western World*, a popular literary and family paper, published by French & Wheat, 13 Park Row, New York. We give this new enterprise a cordial welcome and predict for it large and increasing public favor. The contributions to the number before us indicate thorough acquaintance on the part of the publishers with the tastes of the American public. The stories are chaste and entertaining, the miscellaneous matter selected with great care and judgment, and the editorial matter of a high order in subject, thought, and style.

But the most striking features of this publication are its illustrations, heading, and border. These are printed in colors by a patented process by which the different colored impressions are given to the paper by a single feeding. The process is still in its infancy, yet, notwithstanding the difficulties which attend the earlier stages of any improvement, the effects produced are novel and striking, approximating very nearly to chromo-lithography. The general appearance of the paper is very pleasing, and this method of printing in colors must be considered a decided step in advance.

OBITUARY.

We regret to announce the death of Prof. Wm. E. Jillson, which occurred at his home in Jamaica Plain, Mass., on the 29th ult. Mr. Jillson will be remembered by inventors and others who had occasion to consult the Patent Office Library, from 1860 to 1865, as its accomplished librarian. In 1865 he resigned this position to accept one in the Boston Public Library, where he remained up to the time of his death. He was considered one of the most accomplished bibliographers in the country.

THE Pittsburgh *Dispatch*, in speaking of some of its more useful exchanges, says:

Another paper, of a very different class, which we always read with interest, is the SCIENTIFIC AMERICAN, the best journal of the kind published. It not only abounds with information, of the most useful kind to inventors and mechanics, but its general articles are always well written and full of interest. The number before us is one of the best of the paper which we have yet read, and shows that the publishers are up to the spirit of the times in the way of progress and improvement.

WE are indebted to Messrs. E. R. Jewett & Co., Buffalo, for proof sheets of engravings, designed to illustrate the Patent Office report for 1867. We have so often spoken in praise of these artistic illustrations, that it is unnecessary now to say more than to commend the great fidelity with which these drawings exhibit the real point upon which the claims to a patent are based.

Improvement in Engine Governors.

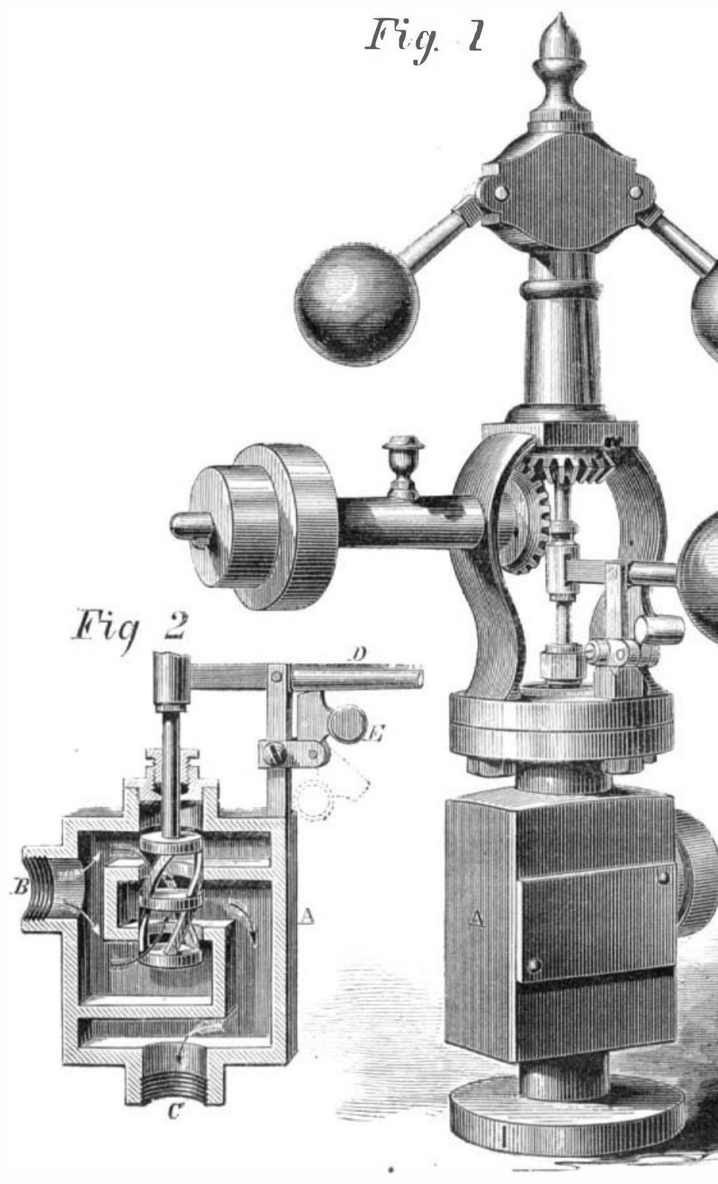
For all stationary engines the governor is absolutely necessary. So much importance is attached to its proper action that it is not surprising that it has been the subject of numerous patents. The governor, to be effective under all circumstances, should act quickly, if not instantly, when resistant force is suddenly added to, or suddenly thrown off the engine; it should maintain an equable speed under occasional and moderate variations in the force to be overcome, and should entirely close the inlet valve should the belt that drives the governor be thrown off or break. It would seem, from an examination of the governor shown in the engravings that these requisites are fully met in this improvement, and this opinion is borne out by letters from the managers of concerns in which this governor has been used for months.

A brief description of the invention aided by a reference to the engravings, will enable the engineer or mechanic to easily understand its construction and operation. Fig. 1 is a perspective view of the governor with its attachments complete and Fig. 2 a vertical section of the valve chamber and its parts. The valve chamber, A, may be either rectangular, as seen, or of other external form, as may be desired. Interiorly the chamber is divided by a partition of an angular S-form, the horizontal portions of which are connected by vertical walls and by the walls of the valve chamber. The two upper horizontals of the diaphragm are bored to form seats for the valve, which consists of three disks attached to the upright valve stem and connected by wings or ribs, being either straight bars or of a spiral form; the latter preferable, as the movement of the valve or combined disks is similar to that of a piston in a cylinder, and the spiral form of connection insures an even bearing and wear against the sides of the apertures forming the valve seats.

In the sectional engraving the valve is shown open. B being the inlet for the steam, the arrows show the directions the steam will take, when admitted, and its escape through the passage, C, to the steam chest. It will be seen that by the provision of double ports for the valve a much smaller valve than is usually employed can be used, which, of course, is an improvement, as its movement can be much more easily governed. The inventor says that the area of an ordinary governor valve of two inches diameter is 3·1416 square inches and that this area may be obtained by the use of one of his improved valves of only one and a half inches diameter.

The valve stem coupling is connected to the governor stem by the ordinary swivel. In this coupling is a slot to receive the end of a lever, D, carrying an adjustable weight seen in Fig. 1, the fulcrum of the lever being on a stand rising from the valve chamber. It is evident that this weighted lever may be used to give a variety of speeds to the engine, or to adjust the speed to the number of revolutions. It is plainly seen, also, that the weight of this lever, when not counterbalanced by the centrifugal motion of the governor balls, will effectually close the valve and prevent the inlet of steam. Thus, if the governor belt should break, or be suddenly thrown off, the valve would close and the steam be cut off. So, also, when the engine is stopped no steam could reach the steam chest and cylinder through the valve chamber. To keep the valve open when about to start the engine, a weighted catch, E, is used to hold the lever, D, up. Soon, however as the velocity of the governor is sufficient to raise the balls and the lever, the catch is released, and falls by its own weight to the position shown in the dotted lines at E, Fig. 2, leaving the lever ready to act in case of accident.

Patented June 9, 1868, by William Bellis, whom address for additional particulars at Richmond, Ind.



BELLIS' PATENT ENGINE GOVERNOR.

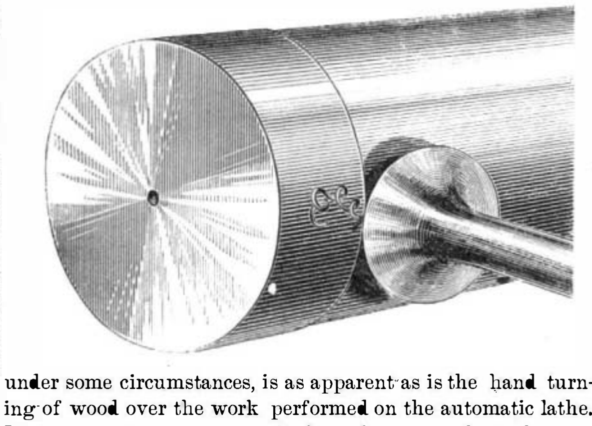
MECHANICAL PRACTICE AT HOME---THE FOOT LATHE.

Foremen of machine shops get their best material for apprentices from the farm. In this statement all managers of shops who have had a lengthy experience will coincide. Why is it? These farmer boys perhaps never saw a machine shop or foundery, yet they betray an aptitude and a liking for the work of the machine shop seldom shown by the city bred boy. To be sure, the lad whose early life has been spent in a manufacturing town or village where the hum of the spindle and the clatter of the loom, or the detonations of the hammer daily assaulted his ears, takes readily to the duties and discipline of the machinist's apprentice; yet frequently the farmer's boy becomes the most intelligent and successful workman. We answer our question by the simple statement that farmers' boys are compelled to practice mechanics in their daily labor. It is not always convenient to stop work and run or ride to the blacksmith's shop whenever any portion of a implement gives out by breakage or wear; and the farmer's boy is compelled to repair the break, often by the use of very inferior tools. He is largely employed in mending, repairing, and making on rainy days and in winter. Even his playthings are more frequently made by himself than bought at the "store." He thus becomes, insensibly perhaps, a mechanic; at least he learns the first lesson of the mechanic's apprentice, the use of tools.

Every farmer should have a shop room fitted up with such tools as are used by the carpenter, joiner, machinist, and blacksmith, or with those that would be valuable in making repairs. Above all, we consider a good foot lathe very desirable. It would be impossible within the limits of a newspaper article to merely notice the advantages of this machine and its varied uses. A good foot lathe costs from sixty to one hundred dollars and the money is well expended in the purchase. Articles of use and ornament made of wood, ivory, and metal may be turned out by the foot lathe convenient for use in the house or on the farm. The practice on the lathe is one of the most fascinating pastimes for a stormy day or an unemployed evening. Apart from its use in making and repairing, the foot lathe is a pleasant companion for the business haunted and brain weary. One who adopts it as a companion of his leisure hours will soon become an adept, and the more he uses and becomes acquainted with his machine the better he will like it. He will be surprised at the number and elegance of the little articles of use and ornament he can produce from the rough material, and at the pleasure that the practice of a mechanical art will afford.

HAND TOOLING---THE BUTTON TOOL.

There is little doubt that the practice of hand-tooling for turning metals is not so extensively practiced in this country as it might be with benefit. The superiority of hand tooling over the absolute action of the fixed tool in the engine lathe,



under some circumstances, is as apparent as is the hand turning of wood over the work performed on the automatic lathe. In our experience as a practical workman we derived great benefit from our knowledge of the use of hand tools. There are various forms of these tools, and they can be made from worn out files or from steel bars, as may be desired. The ordinary triangular file makes a very handy turning tool—in fact it may be ground in three forms, each of which are useful in particular cases. The ordinary flat file is very useful in smoothing or finishing. A square file or square bar, ground at an angle across the corners, is a valuable tool. We show, however, one not so frequently employed as its merits deserve. It is called the "button tool," from the form of the head or cutting portion. (The artist has made the head a graceful bell shape, which is not absolutely necessary). The tool is made by upsetting the end of a steel bar or rod and forming the head in a die. The shape of the head is precisely like that of a common wood screw, and the shank being cylindrical no obstruction to its gradual rotation in the hands of the workman is offered. The tool being fastened in a common chisel handle engages with the work as shown, and while the shank bears upon the rest the hand keeps it against the work and steadily rotates it. In sharpening it the face of the tool is placed against the grindstone and is turned gradually until a perfect edge is secured around the whole circumference. Further description is unnecessary.

CONDENSATION IN STEAM PIPES---LOW PRESSURE.

A correspondent says: "I notice on page 375, last volume, your three line article on steam pressure in the boiler and cylinder being necessarily unlike. How much is the allowance for friction and condensation in the pipes? Please show the probable and actual differences between boiler and piston pressure." Our correspondent misquotes our statement, which was: "Steam pressure in the boiler and steam pressure on the engine piston are not necessarily alike. Allowance must be made for condensation in conveyance by pipes." Our object in stating this self-evident truth was to intimate to engineers and others that in estimating the pressure upon the piston of the engine, as that shown by the gage on the boiler, they may not be correct. Indeed, they are frequently far out of the way. The condensation of the steam in the connecting pipe between boiler and engine is more or less, according to circumstances. If the steam is led through a pipe undefended from the atmosphere, the pipe being fifty or a hundred feet long, as is sometimes the case, it is evident that quite a large percentage of the steam will be condensed, and reach the cylinder in a state of mere vapor, the whole body of steam being lowered in temperature, and its pressure consequently diminished. But if the steam is taken directly from the boiler into the cylinder, as in those portable engines where the engine and boiler are closely connected (the cylinder attached to the top or side of the boiler, and the connecting pipe being only a few inches long), the loss of heat and consequent pressure would be inappreciable, and, therefore, the boiler pressure could be safely taken as an indication of that in the cylinder.

Our correspondent's question as to the amount of condensation and friction is sufficiently answered by the above. As no two circumstances are alike, no unvarying rule can be given; it must be left to the judgment of the experienced engineer or millwright. It is safe, however, to observe the following suggestions, or to approximate to them: Place the engine as near the boiler as possible. Use steam pipe of generous size, with the elbows of much larger transverse area than the straight pipe. If gates are used, let them have large apertures, so as not to "cramp" the steam, and, finally, insulate the steam pipe thoroughly by good non-conducting lagging, or by boxing it with sawdust, tan, or some similar substance. It is well, also, to have a little drip pipe, through which the condensed steam may be drawn off before starting the engine, so as not to depend entirely on the cylinder pet cocks. The working of water in a cylinder is terribly straining.

The Herring Fishery of 1868.

Dr. Louis Feuchtwanger has lately returned from a trip "Down East," and sends us some facts in regard to the eastern herring fishery. He says this season has been one of the most prolific of herrings known for many years, 50,000 herrings being taken at one haul. On the 12th of October 80 hogsheads of herrings were taken at one haul and 30 hogsheads two tides before. Every two hogsheads will yield one barrel of fish oil worth in the market $22·50 per barrel, the oil being used in currying leather and for mixing with other fish and lubricating oils. Beside this product the remains of five hogsheads of fish will produce one tun of pumice or fish guano, the best fertilizer known, and used to mix with inferior guanos and the superphosphates of the various brands, and worth by itself $20 per tun. If mixed with sulphate of soda or even plaster (sulphate of lime) intended for absorbing the ammonia produced by their decomposition, it is not excelled in value by the best Peruvian guano. These facts prove the profitableness of this branch of industry.

The Dunderberg Not a Failure.

The ram, *Dunderberg*, which was sold to the French government a year ago last summer, has withstood batteries of adverse criticism, to which, unlike the more solid compliments of an armed enemy, she was unable to reply. In addition to the attacks made upon her when she was the property of her builder, it was stated, after her sale to the Emperor of the French, that she was a mere tub for sailing qualities, and a mere eggshell for defensive purposes. Time and trial have, however, refuted one of these calumnies, as we learn that the *Rochambeau neé Dunderberg* performs her fourteen measured miles with ease. We are glad to hear that the reputation of her enterprising builder has been sustained.