flask lock in any way, and in other respects it is a useful and valuable substitute for the ordinary attachment. A common nail is used for a key, as that is often mislaid, or in the way of the molder, and nails are always at hand, being used in the work continually.

This invention was patented on April 26th, 1864, by Orrin H. Burdick, of Auburn, N. Y., and assigned to Orrin H. Burdick and D. M. Osborne. For further information address D. M. Osborne & Co., Auburn, N. Y.

FAIRBAIRN ON STEAM BOILERS.

Boiler Explosions.—At a very early period, or about the time when engineers and the owners of steam engines found that a considerable amount of saving was effected by increasing the pressure and working the steam expansively, as had been done in Cornwall in the pumping engine some years previous, it was looked upon as impossible to apply the same principle of expansion to steam engines which gave motion to a fly-wheel and the machinery of a manufactory. This imaginary impossibility existed for a cousiderable number of years; but time and experience revealed that the principle was applicable in both cases, and that the inertia, or *vis viva*, of a fly-wheel was the same as that produced by a vertical lift of the pump-rods and water combined in the reciprocating motion of the steam engine. This having been ascertained, a new conception burst upon the less cautious of the community in the desire to do more work with less fuel and at less cost. Hence followed the desire not only to economize, but to increase the pressure beyond the resisting powers of the boiler, and thus, through ignorance and without consideration, to incur risks of explosions that too frequently were attended with loss of life. It was in this stage of disaster when I was repeatedly called upon to investigate the causes of these accidents that I became acquainted, to some extent, with the theory of explosions, and to which, without the aid of the chemist or mathematician, I had to work my own way to conclusions as best I could. No doubt I might be sometimes wrong; but so are most others laboring under new and untried positions, with nothing to guide them but their own judgment and experience.

In these investigatious I, however, witnessed sufficient to convince me that the great majority of the accidents arose from the mal-construction of the boiler and excess of pressure, too frequently caused by ignorance or gross neglect. These facts led me into a long series of experiments to determine the best and strongest form of a boiler, in the first instance, and the density, volume, and pressure of steam, in the second. It moreover led to the establishment of an association which, in my opinion, has saved more lives, and done more good for the maintenance and protection of property, than any other institution in the kingdom.

It is true there are other associations on the principle of insurance; but these are established for the purpose of securing good dividends to the shareholders, while that over which I have the honor to preside is perfectly gratuitous, and is founded exclusively, at a comparatively small cost, for the protection of life and property. The directors have no pecuniary advantage, directly or indirectly, and give their services gratuitously for the benefit of those who choose to trust their boilers to careful periodical inspection.

I have considered it my duty to mention these facts, and to entreat the owners of this district to avail themselves of the security offered by this association, and they will find not only greatly increased security, but a considerable amount of economy, in the management and durability of their boilers.

Numerous theories have been promulgated to account for boiler explosions; such as shortness of water, red hot plates, explosive spheroidal water gases, collapse of flues, and over-pressure. The most reliable, however, are those of Mr. Colburn and the Astronomer Royal, both of whom appear to have arrived at the same conclusion. Mr. D. K. Clark has also directed his attention to this subject in his article on the steam engine, published in the last edition of the *Encyclopedia Britannica*. Mr. Colburn, in a short but excellent treatise on the causes of boiler explosions, disposes of the erroneous theories of electricity, decomposed steam, spheroidal ebullition, and at once advances the practical causes, instantaneous in their operation, which so frequently lead to boiler explosions. These, according to Mr. Colburn, are as follows:—

1st. The rupture, under hardly, it any more than, the ordinary working pressure of a defective portion of the shell of the boiler—a portion not much, if at all, below the water line.

2nd. The escape of the free steam from the steam chamber, and the consequent removal of a considerable part of the pressure upon the water before its contained heat can overcome its inertia and permit the disengagement of additional steam.

3rd. The projection of steam combined, as it necessarily must be, with the water, with great velocity, and through a greater or less space, upon the upper sides of the shell of the boiler, which is thus forced completely open, and perhaps broken in pieces.

4th. The subsequent disengagement of a large quantity of steam from the heated water, now no longer confined within the boiler, and the consequent projection of the already separated parts of the boiler to a greater or less distance.

These appear to be the chief causes of boiler explosions, as announced by Mr. Colburn. The Astronomer Royal appears, in his paper read at the last meeting of the British Association in this town, to have arrived, with some slight variations, at similar conclusions.

The Astronomer Royal states that:—"A little consideration of the changes in the state of the water and steam which occur during the bursting of a steam boiler, will show that very little of the destructive effect of an explosion is due to the steam which is contained in the steam chamber at the moment of the explosion. The rupture of the boiler is effected by the expansive power common at the moment to the steam and water, both at a temperature higher than the boiling point; but, as soon as steam escapes, and thereby diminishes the compressive force upon the water, a new issue of steam takes place from the water, reducing its temperature. When this escapes, and further diminishes the compressive force, another issue of steam, of lower elastic force, from the water, takes place, again reducing its temperature; and so on, till at length the temperature of the water is reduced to the atmospheric boiling point, and the pressure of the steam (or rather the excess of steam pressure over atmospheric pressure) is reduced to 0. It is the enormous quantity of steam, of gradually diminishing power, which is thus produced from water during the course of the explosion, that causes the disastrous effects of the explosion. Compared with this quantity, the small volume of gas which may happen to be in the steam chamber at the time, is, in boilers of ordinary construction, wholly insignificant, and may be entirely put out of sight in the succeeding investigation.

"2nd. If we compare the course of changes in bursting in two boilers—a large one and a small one—we see that the order of changes is the same in both; but that to reduce the temperature of a large body of water, by a certain number of degrees, a large volume of steam must escape, whereas to reduce the temperature of a small body of water, by the same number of degrees, a large volume of steam (smaller in the same proportion as the bulk of water) escapes. Thus it will appear that the whole volume of escaping steam at a given pressure, and the whole destructive energy of the steam, are proportional to the bulk of water.

"3d. For measure of the destructive energy of the steam, we must suppose the simplest and most easily measurable case, namely, that the steam in expanding drives the piston along a uniform cylinder. It is necessary to ascertrin the value of the pressure F when the steam has expanded so far as to have pushed the piston to the distance x. Then the measure of the total energy is $f d x$ F, the integral being taken from the point where the piston was in contact with the water to the point where the excess of pressure of the steam above atmospheric pressure= 0."

From my own inquiries in the more early stages of boiler explosion, I have generally traced these catastrophes to over pressure. This term "over pressure" has been objected to, but the literal meaning of the expression is, that whenever the elastic force of the steam from within exceeds that of the resisting powers of the boilers, explosion ensues. This may arise from such causes as defective safety valves or corrosion, where explosion may take place at the ordinary working pressure; or it may arise from collapse of the flues, or from mal-construction. One thing is, however, self-evident, viz., that the strength of the boiler in all its parts must greatly exceed that of the pressure of the steam, if we would avoid explosions.

Talent and Opportunity.

Previous to the year 1706, the brass ordnance for the British Government was cast at the foundry in Moorfields; but an accident which occurred there at the above date, led to the removal of the foundry to Woolwich. The circumstances connected with this change are interesting, as well as instructive.

It appears that a great number of persons had assembled to witness the re-casting of the cannon taken by the Duke of Marlborough from the French; and there happened to be among them a young German artisan in metal, named Schalch. Observing some moisture in the molds, he pointed out to the spectators around him the danger likely to ensue from an explosion of steam, when the molds were filled with the heated metal; and at the instigation of his friends, this apprehension was conveyed through Colonel Armstrong, major-general of the Ordnance, to the Duke of Richmond, then in attendance, as the head of the department. This warning was, however, disregarded; but Schalch retired from the spot with as many of the bystanders as he could persuade to accompany him. They had not proceeded far before the furnaces were opened, and, as Schalch had foretold, a dreadful explosion ensued. The water in the molds were converted into steam, which from its expansive force caused a fiery stream of liquid metal to dart out in every direction. Part of the roof of the building was blown off, and the galleries that had been erected for the company were swept to the ground. Most of the foundry-men were terribly burnt; some were killed; and many of the spectators were severely injured.

A few days afterwards, in answer to an advertisement in the newspapers, Schalch waited upon Colonel Armstrong, and was informed by him that the Board of Ordnance contemplated building a new foundry, and had determined, from the representations made to them of Schalch's ability, to offer him the superintendence of its erection, and the management of the entire establishment, when completed. Schalch readily accepted the appointment; he fixed upon the Warren at Woolwich, as the most eligible site for the new building; and the ordnance which were cast here under his direction were highly approved of. Thus, almost by mere chance, was the young German appointed to a situation of great trust and emolument, which he filled so ably, that during the many years he was superintendent of the Royal Arsenal, not a single accident occurred, amidst all the dangerous operations of gun-casting. He retired, after sixty years service, to Charlton, where he died; and his tomb may be seen in Woolwich churchyard.

Taming Fish.

A little girl residing near a pond in Massachusetts, has succeeded in taming some of the fish, by throwing crumbs of bread, crackers, etc., into the water. The species called perch seem to be the most tractable and docile. One of them often takes the end of her finger in his mouth, while another will glide gently into her hand and turn on one side, and so remain, apparently reposing, till raised quite to the surface. The little girl walks out on a plank, sustained a few inches above the water, and before she reaches the end of the plank, the fish may be seen darting rapidly towards their feeding ground. The larger ones, especially, are disposed to drive off the smaller ones, but she keeps order among them by means of stick with a sewing needle attached to the end of it, and when one picks a quarrel he gets a stab and is off at once.

Insurance against Tornadoes.—The Pike County *Democrat* (Illinois) has this advertisement:—"Fire and Tornado Insurance Company, Freeport, Ill., insures against loss or damage by fire, windstorms, and tornadoes. Capital secured by chartered lien on real estate, cash value, $200,000."

Asafetida in Affghanistan.

M. C. Cook communicates to the *Technologist* the following facts in relation to the collection of asafetida:—

"To what was before known with certainty of asafetida in Affghanistan may be added the following particulars, communicated principally by Dr. Bellew, who was formerly attached to the mission to Kandahar. Some portion may be a repetition of the same facts previously obtained by other travelers, and which are hereby corroborated; for other information now communicated for the first time, Dr. Bellew is mainly responsible. This brief notice can, however, only be regarded as supplementary.

"The asafetida of commerce is obtained from only one plant in Affghanistan, viz: *Narthex asafetida*. It grows wild on the hills about Herat and Furrah, and is never cultivated, though hundreds of the Kakar tribe from the Boree family, who collect the gum, remain in the deserts to tend and water the plant.

"The 'tear' sort is the gum resin that exudes, and dries drop by drop, from incisions around the top of the root; the 'lump' sort is the gum resin as it exudes from a broad surface, as when the top of the root is sliced off. The latter sort is more frequently met with than the former, but I do not know of any difference in the qualities of the two sorts. There are several other umbelliferous plants in Affghanistan which resemble the asafetida plant in external appearance, and which also, like it, when wounded, exude a milky viscid sap, but I never heard that the sap of these plants (also gum resins) was ever collected by the natives, though the plants were very abundant, especially on the western slopes and ranges of the Sufaid Koh.

"The frail vaginated stem, or the lower cluster of sheathing leaves (of the asafetida plant)—the former belonging to old plants, and the latter to young ones, —is removed at its junction with the root, round which is dug a small trench about six inches wide and as many deep. Three or four incisions are then made around the head of the root, and fresh ones are repeated at intervals of three or four days; the sap continuing to exude for a week or fortnight, according to the caliber of the root. In all cases as soon as the incisions are made, the root head is covered over with a thick bundle of dried herbs o loose stones, as a protection against the sun; where this is not done the root withers in the first day, and little or no juice exudes. The quantity of asafetida obtained from each root varies from a few ounces to a couple of pounds welght, according to the size of the roots, some being no bigger than a carrot, whilst others attain the thickness of a man's leg. The quality of the gum differs much, and it is always adulterated on the spot by the collectors before it enters the market. The extent of adulteration varies from one-fifth to one-third, wheat or barley-flour or powdered gypsum are the usual adulterants. The best sort, however, which is obtained solely from the leaf-bud in the center of the root-head of the newly sprouting plant, is never adulterated, and sells at a much higher price than the other kinds. The price of the pure drug at Kandahar varies from four to seven Indian rupees per *man-i-tabriz* (about three pounds), and of the inferior kinds from one and a half to three and a half rupees per man.' The asafetida is commonly used by the Mahometan population of India as a condiment in several of their dishes, and especially mixed with 'dal.' It is not an article of general consumption in Affghanistan, though often prescribed as a warm remedy for cold diseases by the native physicians, who also use it as a vermifuge. The leaves of the plant, which have the same peculiar odor as its secretion, when cooked, are commonly used as an article of diet by those near whose abode it grows; and the white inner part of the stem of the full-grown plant, which reaches the stature of a man, is considered a delicacy when roasted and flavored with salt and butter. The annual value of the asafetida trade with India is estimated in the Government Reports of the Northwest Provinces at about £2,200."

New Methods of coloring Woods.

Dr. Wiederhold communicates to the *Neues Gewerb fur Kurhessen* the following directions for coloring wood:—"The surface to be colored is smeared with a strong solution of permanganate of potash, which is left on a longer or shorter time, according to the shade required. In most cases five minutes suffice. Cherry and pear-tree woods are most easily attacked, but a few experiments will serve to show the most favorable circumstances. The woody fiber decomposes the permanganate, precipitating protoxide of manganese, which is fixed in the fiber by the potash simultaneously set free. When the action is ended, the wood is carefully washed, dried, and afterwards oiled and polished in the ordinary way. The effect of this treatment on many woods is said to be surprising, particularly on cherry wood, to which a very beautiful reddish tone is communicated. The color is in all cases permanent in light and air."

The Pneumatic Despatch in Liverpool.

Mr. C. A. Varley, of Liverpool, has invented an improved apparatus for the transmission of parcels on the pneumatic principle. The novelty (?) of Mr. Varley's invention consists in the use of compressed air as a motive power for the propulsion of carriages in one direction, while a vacuum is created for their transmission in the other.

The Liverpool *Mercury* gives an account of the experiments made on Wednesday, June 22, at the offices of the Electric Telegraph Company, in Castle-street. Several messages were transmitted to and from Water street, the time occupied in the journey being a fraction over 16 seconds. The distance was stated to be about 300 yards, which gives a speed at the rate of 40 miles an hour. The power of self-action possessed by the apparatus is extraordinary; the clerk has nothing to do but ring the electric bell, put the message in the tube, and press one or other of three buttons, and the whole thing is done. It is intended, indeed, to make electricity perform the last of these operation, and then the apparatus will be as nearly automatical as it is possible for machinery to be. One great advantage claimed for the Varley system over the old plan that is, while the pressure obtained in the latter was limited to that of the atmosphere—namely, 15 pounds to the square inch—any amount of pressure can be obtained by the use of compressed air. In the present case the pressure employed is only 11 pounds, but greater pressure can be reached if necessary.

The Liverpool correspondent of the London *Engineer* says :—"One of the elctric telegraph companies has introduced the pneumatic dispatch system into Liverpool. In the cells beneath the central office of the company in Castle street is an engine usually worked at about one horse-power, though much more force can be gained if necessary. This engine works a double air-pump, which removes the air from one chamber and forces it into another. The chambers are called the 'exhaust' and the 'compressed air' chambers; and are connected by pipes and valves with the apparatus in the room on the first floor. If a message has to be sent, it is placed in a little round flannel bag made to fit loosely into the tube. A valve is then opened in connection with the compressed air chamber; the compressed air, which is kept at 11 lbs. on the square inch, rushes into the tube, and the bag is urged with immense rapidity to its destination. On its arrival there the signal is given on an electric bell, the valve stopped, and the operator is ready to receive the return message. The signal is given on the electric bell, and the valve and all outer communications at the operator's end closed. A communication is then opened with the exhaust chamber, and the air, rushing from the far end to supply the vacuum, brings the little bag along with it. On its arrival a spring is touched, the valve falls and the air rushes in. The operator is then able to open the case and take out the message. The average speed of these tubes, which are 1½ inches diameter, is about forty miles per hour, so that any number of messages may be sent or received from the exchange in 17 seconds. The arrangements have been carried out under the superintendence and direction of Mr. C. E. Varley."

THE APPROACHING FAIR OF THE MARYLAND INSTITUTE.—The seventeenth annual fair of this institute will be held in Baltimore, Md., on Monday evening Oct. 3d. These exhibitions have heretofore been highly creditable to the managers, and there is every reason to expect that the approaching one will be equal to the others. Manufacturers should avail themselves of this opportunity to introduce their goods in that part of the country. An advertisement can be found on page 63, current volume. Circulars can be had by addressing W. C. Cornthwaith, Actuary. Baltimore, Md.

Hot Springs of the Paso de Robles.

A correspondent of the San Francisco *Bulletin* gives the subjoined description of the Paso de Robles (Pass of the Oaks) Hot Springs, which are situated near the coast, in San Luis Obispo, California:—

"These springs were discovered about eighty-five years ago, and timbered up and improved by the Fathers of the Missions of San Luis Obispo, San Miguel, San Antonio, and Santa Ynez, where annually they used to congregate with their flocks for the improvement of their health, living in camps made of brush tents, and driving with them cattle and horses for food and convenience. The timbers placed in the springs by the Fathers at that time, are now as sound from decay as when first placed there, though over eighty years have elapsed since that time. Standing upon the edge of the spring is a large cotton-wood tree about 20 inches in diameter, with its roots running into and about the hot water. This tree is the product of a riding whip stuck in the soft bank thirty years ago, by an old California lady who now resides at Monterey. The dry weather has no effect upon the quantity of water, which runs a stream of about three cubic inches. The great earth quake of 1856 collapsed some subterranean passage, and since that time there has been about double the amount flowing from the spring. The temperature of the water is about 110° Fah., which would seem too hot for bathing. On the contrary, however, it is the most delightful bath I ever enjoyed.

"The climate there must be one of the most healthy of the State. The locality is a dry valley from one to three miles wide by about ten miles long, elevated about 1,000 feet above the sea. The valley is bounded on the east by the coast range, and on the west by a spur of high hills which terminate at Monterey Bay.

"The ranch, including the spring, has lately been purchased by Dr. T. D. Johnson, of San Jose, for $20,000, which seems an enormous price to pay for a league of barren land; but the spring appears to be all that he prized, and taking all the disadvantages that must always attend a trip to them into consideration, he may succeed in making this the watering-place of the State. He now has a new hotel in progress, and a fine bath-house, which will be finished in a few days. He intends to fit up the present house, or hotel as they call it, as a hospital for those who come for health only. He devotes his entire time in healing the sick free of charge. There are now about ninety patients here. Many of them for want of room are living in tents and brush houses. San Francisco is well represented by rheumatism and gout. The entire expense of stopping here, providing you are fortunate enough to get a good room, including board and baths, is only $9 per week, and those who are able can indulge in the luxury of the finest hunting in the world. Within three miles of the house there may be found game, from ground squirrel all the way up to deer, grizzly bear, and 'California lion.'"

PATENT OFFICE REPORTS FOR 1863.

The last session of Congress authorized the printing of 40,000 copies of the Report of the Commissioner of Patents for 1863, of which number 30,000 copies are for the use of the Representatives, and 10,000 for the use of the Senators. The Report will contain 3,566 illustrations, with the claims of all the patents granted during that year. Congress has adopted as a standard for future reports that for 1861, and a contract has been concluded with Messrs. E. R. Jewett & Co., of Buffalo, N. Y., to prepare the illustrations. We have frequently alluded to the illustrated work done on these reports by the above firm, and cannot forbear to express our great satisfaction at the action of Congress which continues the contract in their hands. The work done by Messrs. Jewett & Co., is highly creditable to their skill—they have a just regard for their reputation—and Congress shows a just appreciation of the valuable labors of our inventors by embodying their inventions into handsomly illustrated volumes, worthy to be preserved in private and public libraries.