The Cause and Remedy for Steam Boiler Explosions.

MESSRS. EDITORS—The alarming frequency of the explosions of steam boilers has induced me to give the public, through the medium of your columns, my views of the cause of these explosions, and the necessary precautions to prevent them.

The causes of explosions are, 1st, a want of water over or against the fire surface; 2d, a want of proper construction of boiler to keep the water on or against the heated surface; 3d, sediment covering the fire surface and expelling the water therefrom; 4th, want of properly bracing all the surfaces that are not a perfect cylinder; 5th, using too great a pressure of steam in a large boiler.

Many boiler-makers think because a cylinder of two or three feet in diameter will stand a pressure of one hundred pounds on the square inch of 1-4 iron, that any size of boiler will stand the same pressure; but the increased strength of the iron should correspond with the increased diameter of the boiler.—For instance, a cylinder of two feet in diameter will bear double the pressure on the square inch that a four feet cylinder will of the same thickness of iron and quality.

It is very convenient sometimes to mystify explosions by attributing them to some unaccountable cause, when they were caused by gross carelessness, or a want of good material or judgment in the construction of the boiler; and the most convenient excuse for an explosion is that hydrogen or some other gas was generated, and took fire for the want of water in the boiler. Now I have been constantly employed in the construction and use of boilers for the last thirty years, and I never had an explosion of one of my construction, or of any one that I have used, and I have never known of an explosion that I could not satisfactorily show a plain unmystified cause that might have been prevented; and I challenge any man to show me any way that gas, or any other substance in the common use of boilers, can be more expanded than water.

I have used boilers for years, the greater part of the fire surface of which became red hot more or less every day, and which had an unobstructed opening with the reservoir of steam or water, but the pressure was inside of a strong tube, not on the outside of a thin flue which would have collapsed with an ordinary pressure of steam. As for water becoming more explosive by being retained in a boiler for a long time, or in other words, not drawn off, and a fresh supply pumped or let in, it is an assumption which the practical use of steam boilers with pure water cannot sustain, for in most boilers I presume every drop of water that is in the boiler in the morning is evaporated before night, and fresh water taken in its place—I speak of fresh water, not salt. I have used boilers in which the water was not drawn off for six months; and I have used boilers, or had the oversight and superintendence of them, that have been fed from gutter and with snow water, and the only bad effect this dirty water had—if the sediment was not often taken out—was the settling to the bottom of the dirt, covering the fire surface, and causing the iron to burn through and leak. The engine, however, worked well, and there was no perceptible difference in the kind of steam generated from it than from the purest water.

To prevent explosions in cylindrical boilers, avoid constructing or using them with large flues, or using too large cylinders with thin iron for high-pressure steam; brace well all flat or other surfaces that are not perfect cylinders, with socket balls, having large heads on both ends; construct such boilers in such a manner that the fire surfaces shall be so far apart that the currents of steam when generating rapidly shall not carry off the water and leave the fire surface to burn through.

Cleanse the boilers often. The locomotive boiler generally explodes in the fire-box, and does much damage. To prevent this, the legs should be made of sufficient width, so that the current of steam when generating rapidly shall not carry the water up and leave the fire surface to burn out. Hand holes should be placed between each row of socket bolts at each end, and at the side of the fire-box, for it sometimes happens that the sediment accumulates above the first tier of brace or socket bolts, and prevents the water from coming to the fire surface, the iron burns through, and there is an explosion.

The usual way of constructing locomotive boilers is to have one hand-hole below the first tier of socket bolts, and some builders only put in screw bolts with separate heads. It is a common thing to hear persons having charge of boilers complaining that their boiler "foams;" I have often inquired the cause of this, but have never heard the real one assigned. The real cause is, the fire surfaces are so near together that the currents of steam expel the water from between the surfaces, and of course the water is carried up to the gauge-cock; this may also occur in the leg of the boiler, or between the pipes.

This foaming or priming, as it is called, is most prevalent in new boilers, for this reason; the metal being new and clean, the caloric or heat passes through the metal more rapidly, and generates the steam much faster, and therefore the currents of steam upward have a greater velocity. To prevent this foaming, some engineers will throw in one substance, and some another, but for what reason they do not know. The real effect of that which they throw in is to coat over the fire-surface with a non-conductor of caloric, preventing the too rapid generation of steam. This, however, reverses the object for which the boiler was constructed. Now if the boiler makers would place their tubes a short distance further apart, and keep them cleansed, they would generate more steam with a less number of pipes, and these be less subject to burn out, and would not foam. It is not only the pipes that cause the boiler to foam, but other parts of the fire surface of the boiler may also be so near together that the water is expelled by the currents of steam, particularly the legs of the boiler.

The SCIENTIFIC AMERICAN of August 22d, 1855, page 381, quotes some experiments made in London by William Radley, chemical engineer, who had contributed an account of them to the London *Mining Journal* of June 28th. But what do Mr. Radley's experiments prove?

Mr. Radley had three boilers, numbers 1, 2, and 3; the water in No. 1 was much hotter than the water in Nos. 2 or 3; the water in either was hotter than the steam in either. This is very easily accounted for. The water in No. 1 is hotter than the water in Nos. 2 or 3. No. 1 being over the furnace, it receives its caloric at a much higher temperature than Nos. 2 or 3, and the caloric is at a much higher temperature as it passes from the furnace through the water than the steam on the inside of the boiler, because the caloric passes off rapidly from the top of the boiler. If Mr. Radley had continued his experiments a little further, and had applied the same heat to the top of the boiler that he did to the bottom, he would have equalized the temperature of the water and steam, but would not have equalized the temperature of the water in Nos. 1, 2, or 3, because the temperature is less at every foot as it passes from the furnace to the chimney.

There is no doubt but many a boiler has been exploded by pumping in fresh water, or by the moving of a boat surging water over the red hot surface of the flue, or other part of the boiler, thus causing a sudden expansion of steam.

Every Inspector of Steamboats should be a practical engineer or boiler maker, and he should first inspect the engineer in charge, and then examine the construction of the boiler.

At every explosion the coroner or Inspector should summon a jury of experienced engineers or boiler makers not in any way connected or concerned in the construction or building the boiler or furnishing the material, and this report should be published to the world. If this were done in every case, the public would soon find out that there is no mystery connected with steam boiler explosions. M. BATTEL.

Albany, N. Y., Feb., 1857.

Crawford, the eminent American sculptor, is reported to be suffering from a cancer tumor in one of his eyes, which threatens not only to deprive him of his sight, but life.

[For the Scientific American.]

The Right Whale.

These whales, being most sought after, are scattered over all parts of the ocean, and are sometimes found gathered in schools, rusticaing in the waters of the torrid zone, where they are not generally looked for, and find rest from the untiring pursuit of the whalemen. Our ship was full, and homeward-bound, but we had not thrown over-board our tri-works, we neared the Island of Ascension to take in some turtle. Somehow we missed the Island in the night, and on the following day raised a school of Right Whales ahead; the sea was smooth, the sun hot, and the pitch boiled in the seams of the ship's deck. A consultation was had, and all agreed to go on short allowance of water, for the purpose of making room for the oil. We then lowered our boats and killed two of them, and had to prick several others to get them out of the way; the school then took a southerly direction, and showed "white water" to the horizon. These two whales yielded two hundred barrels of oil.

The Dutch whaling ship *Clementine*, of Bremen, describes, in her log, a difference between the native polar Right Whale and the common Right Whale. Those of the former are larger, having a small fin on the back, and one makes from two to three hundred barrels oil; by some it is called the "Great North-West Whale." Some Right Whales are black and white-spotted; some are all so white that snow would reflect a blue cast compared with them. The uniformity of the soundings of whales indicate a bottom not far off; and in going from ocean to ocean they double the capes as well as the most experienced seaman; they follow the curve of land about seventy miles from shore, and are then frequently taken by the knowing whalers on their track. ***.

Tempering Mill Picks.

MESSRS. EDITORS:—I have been in the milling business for a number of years, and have been very much troubled to get mill picks tempered so as to dress burr stone properly. I may safely say that hardly one blacksmith in five hundred, throughout the country can temper picks uniformly well.

I think it was Bayard Taylor who, when lecturing at Elmira, N.Y., in speaking of the "lost arts," said that there had been columns of stone found at the East, carved from top to bottom, and so hard that our best steel would not cut them; he also stated that they were said to have been carved with tools made of "tempered copper."

Be this as it may—it would be very desirable if there could be some information illicited through the columns of your paper in regard to tempering mill picks.

W. L. COLBORN.

North Hector, N. Y., Jan., 1857.

[Much has been said of the fine temper of ancient copper tools, and in the same style as that reported of Bayard Taylor, in the above extract. It is our opinion that the steel tools of the present age far surpass the best copper ones used by the ancients, for any purpose.]

Restoring Oil Paintings.

MESSRS. EDITORS—Perhaps the following is not known to the readers of your valuable journal:—Paintings that have been discolored by age or bad usage, may be restored to their original brilliancy without the slightest injury to the canvas, by being simply moistened with the liquid known to chemists as the deutoxyd of hydrogen. PRIAPUS.

[Deutoyxd of hydrogen is sometimes called peroxyd (HO_2) the common name for it is "oxywater;" it is not easily manufactured. When as free as possible from water, it is a syrupy liquid, colorless, and possessing a disagreeable odor. It is a very peculiar liquid, and there are many phenomena connected with it which chemists cannot explain. It is easily decomposed by contact with many metals and oxyds; the oxyd of silver decomposes it with an explosion.

A very safe and excellent method of cleaning oil paintings, is to wash them with a sponge dipped in warm beer, then dry them thoroughly with a soft cotton cloth. After this the picture should be treated with a thin coat of dilute gum arabic dissolved in soft water. It is very desirable that the deutoxyd of hydrogen should be prepared by some more simple method than is now known. It is believed by some physicians to possess valuable medical qualities, but at present it is not employed in medicine, owing to the great difficulty of obtaining it; and although it may be very useful for restoring old oil paintings, it is not easy to obtain it for this or any other purpose.

Cheap and Good Ink.

Take one gallon of soft water, and in this put 2 ounces extract of logwood; boil ten minutes, and then add 24 grains bi-chromate of potash, and 12 grains prussiate of potash, and stir them a few minutes while on the fire; now let it cool, and it will be fit for use. Pulverize the ingredients before putting them in the water. Ink made in this manner is equal to any in use. It is of a blue black color, but changes to a jet black after exposure. I have made considerable of it, and think it is better than most of the ink sold in stores. One gallon will not cost more than eight cents. Any of the materials can be bought in common drug stores. A. P. W.

[We have published various recipes for making writing ink; and, leaving out the prussiate of potash in the above, this is similar to one which we have already published. Prussiate of potash may render the ink more permanent but will not improve its color. While the above ink is easily made, is cheap, and will answer very well for common use, it is not so permanent as ink made of nut galls, logwood, and the sulphate of iron.

Balloons in Warfare.

The French correspondent (J. Nickles) of *Silliman's Journal* gives the following account of various efforts to employ balloons in warfare:—

"The Academy of Sciences in Dijon having asked of that in Paris aid and money for an aerostatic ascension *a ballon captif* which it proposed to try, a discussion arose in the Academy of Paris in regard to the utility of such ascensions for scientific purposes. Marshal Vaillant, Minister of War, mentioned on that occasion the trials made in the spring of 1855, at Vincennes, under the direction of artillery, engineering, and marine officers. The object was to ascertain if it were possible to maintain a balloon five or six hundred meters above a fortified town, and if so, to cause incendiary or fulminating balls to fall. Nothing was successful. The commission made two balloons, spent much money and gave up every thing. According to Vaillant, the force of a wind, even moderate, will always be enough to drive to the earth a captive balloon.

Biot, on the contrary, defended ascensions *a ballon captif*, having a scientific object. If the descent of the balloon is dangerous above a place of war, it is otherwise in an open plain.

Biot, who made, in 1803, with Gay Lussac, a celebrated ascension, recalled the many and fruitful experiments made by the school of *aerostiers* founded under the first Republic, and which rendered great service in the sieges of Charleroi and Fleurus by balloon observations.

Jomard, the geographer, who attended this school, stated that he had made and witnessed, since 1797, a great number of ascensions *a ballon cavtif*, and that Col. Coutelle, sub-director of the school of *aerostiers* never doubted the utility of such ascensions when well directed, which may not have been the case at Vincennes.

Photographing Old Manuscripts.

In the city of Berlin, Prussia, the application of photography in duplicating old and valuable manuscripts is carried on extensively and with success. An old copy of the New Testament in the Gothic tongue, written on parchment, and dating back to the fourth century, has been thus duplicated, and a great number of copies re-produced.

Cultivating Liquorice.

Several gentlemen have recently acquainted the Patent Office with their success in cultivating the liquorice plant, which is hardy as far north as Connecticut. It is employed not only for medicinal purposes, but they say is used in preparing ale and porter.

New Inventions.

Applying the Waste Gas of Blast Furnaces.

Within the past few years an immense saving of fuel has been effected in some iron-smelting establishments, by conducting the waste heat of the blast furnaces under boilers to generate steam for driving the machinery employed.

The venerable Dr. Nott, of Union College, Schenectady, N. Y., was the first inventor who attempted to save the waste heat of blast furnaces, and apply it usefully, and his invention has now come into very general use. Hitherto, however, the application of the waste gases of such furnaces has been defective, owing to the difficulty of making the hot gases descend from the top of the blast stack under steam boilers placed on the ground, thus rendering the system almost inapplicable to iron works built on level ground. This difficulty has been entirely obviated by the improvement in blast furnaces for which a patent has been issued this week to Henry Weissenborn, of this city, whose claim will be found on another page.

By Mr. Weissenborn's invention the hot gases of the blast furnace are stored up in a reserve gas chamber, and made to descend easily from the top of the blast furnace under boilers placed on level ground. This improvement is not merely theoretically good; it has been practically and successfully applied at the Eurioka Iron Works, Wyandotte, Mich. In a letter before us from D. Webb, the Superintendent of the Works, and Joseph H. Harris, chief founder, it is stated that the various blast furnaces in New York, Massachusetts, Connecticut, and Pennsylvania were visited to obtain the best plan for building the furnaces, and Mr. Weissenborn's was at last selected as being the most feasible for the situation, it being level ground.

The furnace was commenced in 1854, but many persons who professed to be acquainted with furnaces, pronounced the project impracticable during its erection, but when finished it operated perfectly, and with the most satisfactory results. The letter says:—"The hot gas came down without extra fans under the boilers, and into the hot blast, and during an experimental trial of twenty-two days, at no time was all the waste heat used for generating the steam and heating the blast." Thus the whole cost of fuel for driving the steam engine in these Iron Works has been entirely saved by this improvement. Every invention which economises waste in fuel is of vast consequence to the iron interests of our country.

Raking Attachment to Reapers.

RAKING ATTACHMENT OF REAPERS.

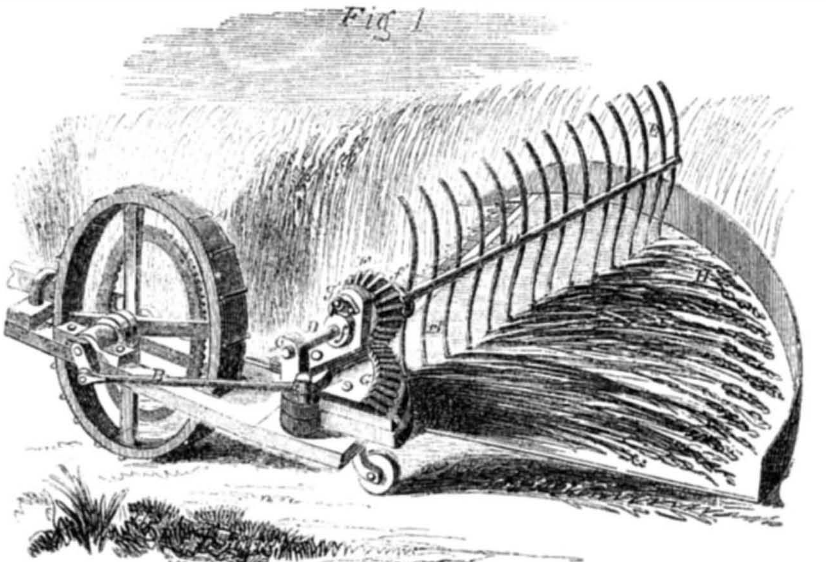


Fig. 1

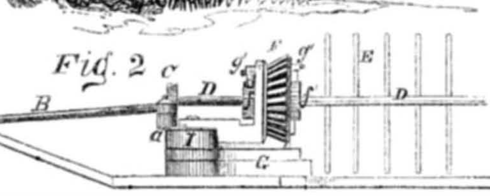


Fig. 2

The accompanying illustrations are a perspective view (figure 1) and a side elevation (figure 2) of an improved raking attachment for reapers, for which a patent was issued to James H. Thompson of Newark, N. J., on the sixth of last month (January, 1857.)

The rake has an intermittent vibrating and rotary motion, whereby it rakes off the cut grain in gavels, in a very simple and ingenious manner.

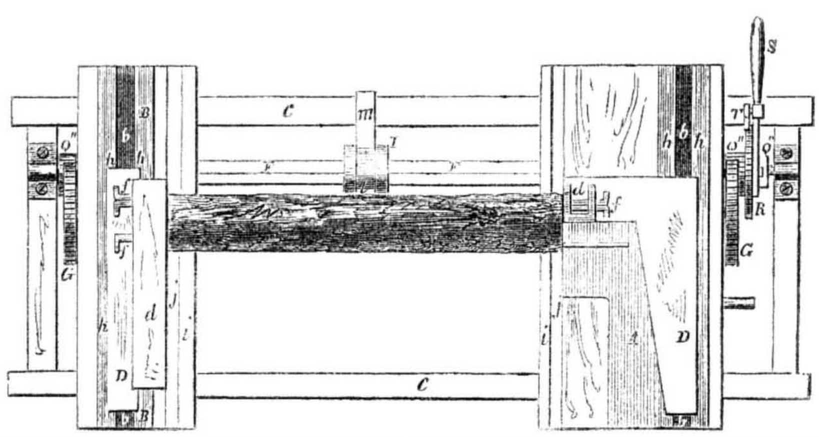
A is the driving wheel of the machine; on the outer end of its axle is a crank. B is the connecting rod, which is united by a crank pin, *a*, to the vibrating frame, C; this frame has two lugs, which form supports and bearing, S, to the spindle or shaft, D, of the rake; E E are the curved fingers, or teeth, of the rake; *f f* are two circular ratchets keyed to a shaft, D. Each of these has two notches on its periphery. *g' g* are two spring pawls secured on fulcrum pins; one is secured to the inner standard or support of the small sliding frame, C; the other is connected to the face of the bevel pinion, F, which is loose on the rake shaft. G is a segment of a circular rack with bevel teeth; it is bolted on a fixed block. The bevel pinion, F, gears in this rack, and receives a semi-rotary motion, back and forth, while being moved on it, with the vibrating frame C. H is the platform to receive the cut grain; it is of a semi-circular form, and has a side curb. The cutting knives are formed and operated in the usual manner. The vibrating frame, C, is secured on a center to a fixed guide block, I, below.

As the machine is drawn forward, the connecting rod, B, imparts a back-and-forth motion to the frame, C; it swings, as it were, on its vertical center pin in the block. The ratchets, *f f*, being secured to the shaft, D, of the rake; the pawls, *g' g'*, according as they are thrown out, and take into the notches of these ratchets, give the desired motions to the rake. When the rake is at the front end of the platform to rake back the grain, the front pawl, *g'*, takes into a notch, *f*; and as it is secured on the support of the frame, C, it holds the ratchet firmly, while the frame is moved backwards, thus allowing the bevel wheel, F, to rotate loosely on shaft D, which, being moved back on the bevel rack, G, the rake shaft is prevented from revolving. It is thus that the rake, with its teeth down, as shown, moves directly back to the hind part of the platform, gathering the grain into a gavel in its circular sweep, and discharging it at the back end. Whenever the gavel is discharged, the pawl, *g'*, on the bevel wheel, is brought round to catch at that instant into the notch in the ratchet, *f'*, therefore, when the bevel wheel commences to revolve forward in returning, this pawl, gearing the ratchet to the wheel, gives a partial rotation to the rake which lifts its teeth above the platform, and then, when it carries the rake to the front end, it has revolved sufficiently to depress its teeth down to the platform, to rake backwards; the pawl, *g'*, on the support of the frame C, then takes into the ratchet, *f*, and holds the rake shaft firm while the rake is moving back, as has been described. The rake shaft has, therefore, a continuous intermittent rotary motion forward, in conjunction, with its reciprocating motion.

This improvement in the raking attachment of reapers appears to be excellent in every respect. The motions are correctly timed, and directed to effect the objects of raking in a complete manner, and by very simple but very ingeniously arranged devices.

More information may be obtained by addressing Mr. Thompson as above.

COMBINED HEAD AND TAIL BLOCKS FOR SAW MILLS.



This illustration is a plan view of an improvement in combining and operating the slides of the blocks of a saw mill, whereby with one motion of the lever the two slides are moved with ease, simultaneously to feed the log the exact and equal distance tranversely to the saw for each new cut.

A is the head block, and B the tail block, with a log represented as dogged between them, ready for sawing a new board, the saw being supposed to be hung and moving in the slot nigh the head of the log. *c c* are side timbers of the carriage which feeds the log forward to the saw; they support the head and tail blocks, which are moved on them to adjust them for logs of different lengths.

D D are metal slides to which the log is dogged. Those slides have racks secured on their under sides, and they move in grooves, *b b*; two pinions (one for each rack), on a single long shaft extending under the head and tail blocks, take into these racks and move them. These racks are cast separate from the slides, and can be easily and cheaply repaired or changed.

d d are posts cast on the top of the slides; the ends of the log are firmly dogged to these by the pins, *f f*, which are inserted through openings in the posts, *d d*, and forced into the ends of the logs. There are hooks underneath on the slides, which hook under parallel ribs, fastened to the head and tail blocks, thus keeping the slides firm on the blocks. The log thus secured on the carriage between the head and tail blocks may or may not touch the parallel ways, *i i*.

F is a horizontal shaft running under the head and tail blocks with its bearings in cross timbers in the carriage. It connects the head and tail blocks, and passes through two short hollow shafts or tubes attached to those blocks. I is a supporting box pulley for sustaining shaft F, when it is of great length, and whilst sawing long logs. This shaft passes through an opening in its center; it has a groove in its periphery to receive a semi-circular collar, *l*, which rests upon a sliding arm, *m*, attached to one of the side timbers of the carriage and can be slid to the right or left to move the supporting pulley. This support prevents the shaft sagging, and also from breaking if a log should fall down upon it.

G G are two cog wheels secured on two short transverse shafts. Q Q, on which there are pinions (not seen) for engaging in the racks on the under sides of the slides, D D and by which the log is set. On the two short hollow shafts mentioned—one secured to each head and tail block—are pinions, Q″ Q″, into which the large cog wheels, G G, gear. R is a ratchet dividing wheel on the axle of the pinion Q″. T is a pawl which takes into this ratchet wheel. S is a setting lever—the pawl T is attached to it. This lever is loose on the shaft of pinion Q″, the shaft being its fulcrum in setting the log. By actuating the lever, S, motion is communicated simultaneously to the slides of the head and tail blocks through the shaft, F, by the pinions on the under side of the slides, D D. The log remains on the head and tail blocks until sawed up into boards, and the sawed boards remain on the blocks in single stack till removed in a body when the mill is stopped.

The two wheels, G G, are of the same size, with equal cogs and pitch; the two outside pinions, Q″, are of equal size, cogs and pitch; the two pinions on shaft F, under the racks of slides, D D, are of equal size and pitch, and so are the racks. The ratchet or scale wheel R, is spaced off with 32 equal cogs .5 of an inch pitch. The wheels and pinions are of such a size and relationship to one another that the slides, D D, which feed the log to the saw, are moved one-eighth of an inch for each cog of the wheel, R, moved by the lever, S, and held in place by the pall, T. This result may be varied by altering the gearing but preserving the combination.

This improvement dispenses with the labor of a tail sawyer entirely; the sawyer sets both ends of the log with the lever, S, in an instant, and without leaving the back of the saw. By setting both ends of the log accurately together, boards are sawed exactly of an equal thickness throughout, which effects a great saving of lumber, as all boards of unequal thickness are held to be defective, and almost useless.

This improvement is adapted for circular as well as up-and-down saw mills. The logs are not hollowed out to sit on the log way, consequently no thick and thin combs are made at the center of the log. The arrangement of the lever, S, and the gearing, enables one man to exercise great power with ease in shifting the log.

A patent was granted to J. S. Snyder, of Lancaster, Ohio, for this invention, on the 5th of February, 1856, and the patentee informs us that it has already come into extensive use in Ohio, and has received first premiums at the late State Fairs of Ohio, Michigan, Virginia, and Pennsylvania. It is a labor and lumber-saving improvement. More information may be obtained by letter addressed to Mr. Snyder.

Iodurretted Glycerine in Skin Diseases.

This preparation is recommended by Dr. Gage, of New Hampshire, and is made by dissolving one part of iodide of potassium in two parts of glycerine, and turning this liquid upon one part of iodine, which is thus completely dissolved. This solution has the advantage over alcoholic solutions of not drying. By this means the surfaces to which it is applied remain supple, and the action and absorption of the iodine remain for a long time. In employing it, the diseased parts to which the solution has been applied, are covered by paper of gutta percha, to prevent evaporation of the iodine.

[The above is from the *Druggists' Circular and Chemical Gazette*, published in this city—it appears to be a good recipe. Dr. Dixon, of London, author of an able work on diseases of the eye, recommends iodine in cases of chronic opthalmia, and asserts that the best method of applying it is to the outside of the eyelid. The above preparation of iodine and glycerine, is excellent for applying the iodine to the skin to prevent its rapid evaporation.