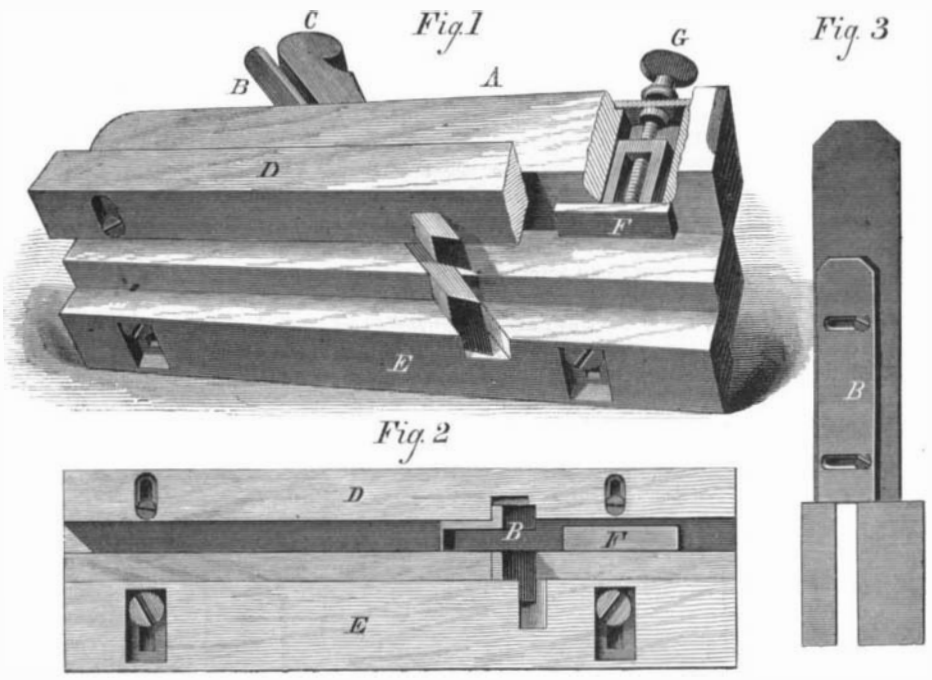
IMPROVED MATCH PLANE.

We illustrate herewith one of those ingenious devices which in a single instrument combines the capabilities of a variety of tools. It consists in a match plane which, by suitable adjustments of its parts, may be set to tongue boards of any thickness.

A is the main stock, B is the iron, and C the key, shown in the side view, Fig. 1. The face of the tool, Fig. 2, is formed in two parts, one of which is an adjustable piece, D, which, fitting into a rabbet of the stock, is made adjustable laterally thereon by screws passing through slots, as shown. By moving this piece out or in, the length of the mouth of the tool is varied so as to correspond with the width of the adjustable iron, B. The latter, Fig. 3, is made in two portions, also connected by screws and slots so that the space between the cutting edges may be made broad or narrow to receive the tongue, which is cut of corresponding size.

E, Fig. 2, is a guide adjustable on the face of the tool by the same means as above described, and F is a gage operated by the thumbscrew, G, for regulating the depth of the cut. Any ordinary plow iron may be used in the grooving tool, and the tonguing tool may be adjusted to suit the groove. With a single pair of implements therefore, it is claimed, the operator is enabled to perform work which ordinarily calls for the use of a multiplicity of devices, thus saving much expense and trouble. Patented through the Scientific American Patent Agency, June 10, 1873, by Mr. James Edwards, of No. 323 Fifth avenue, Brooklyn, N. Y., from whom further particulars regarding sale of patents or State rights may be obtained.



EDWARDS' MATCH PLANE.

THE GLOBE STEAM GAGE.

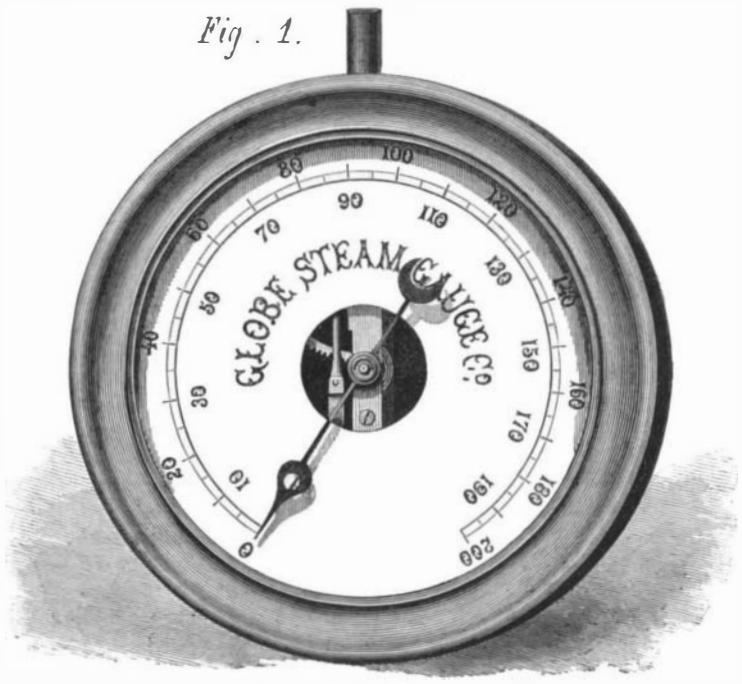
The amount of correspondence concerning boiler explosions, which has been lately published in scientific journals points out the importance of a trustworthy pressure indicator, which can be relied on, at all times, to show any variation in the force within the boiler, and to indicate the same accurately after long continued use.

The invention which we illustrate herewith is a steam gage of quite simple construction, which we are informed has been in use on the Erie railroad for four years past, during which period it has not varied one pound from the test gage with which it was first compared. Various certificates from railroad officials and others, submitted to us by the owners of the patent, speak highly in recommendation of the instrument, so that it may be fairly considered as having successfully withstood the test of actual experience.

Fig. 1 gives the appearance of the dial of the apparatus, and Fig. 2 a section showing the essential portions. A is the case, and B a metal spring, the space, C, in rear of which contains water. Steam enters from a pipe at D, and presses the spring inwards into the position of the dotted line. The motion of the spring, by suitable lever and other mechanism, is transmitted to the dial needle which registers the pressure in accordance with the amount the spring is driven inward. The instrument is very sensitive and accurate; and it is claimed that it will withstand a heavy pressure without the spring becoming permanently set, and also that at 140 lbs. pressure the spring is forced out from the center ⅛ of an inch. Under a pressure of 700 lbs., to which the apparatus was subjected a short time since, at the manufactory in Waterbury, Conn., the spring was reversed in form and blown out, falling some ten feet distant.

It is further stated that the gage does not get out of order, and that when in use upon a locomotive there is no vibration or trembling of the pointer, no matter how high the speed at which the engine may be running.

For further information, address Messrs. Austin M. Hayward & Son, Susquehanna Depot, Pa.



THE GLOBE STEAM GAGE.

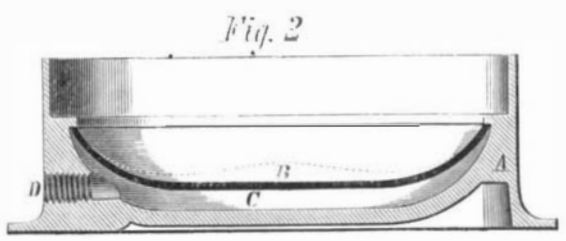
Test for Copper and Tin in Extracts.

The poisonous nature of copper, and, to a less degree, of tin, makes the following method of testing for them in an extract, as described by Hager, both interesting and useful, for either of these metals may have been dissolved from the walls of the vessel in which it was prepared. "The extract is, for this purpose, dissolved in five parts of water, or very dilute spirits, and slightly acidified with a drop or two of hydrochloric acid. A bright strip of zinc is placed in the solution, and, after half an hour, if no impurities are present, the zinc will be found as bright and colorless as when first put in. If, however, copper and tin are present, it will be coated with brown film; if tin alone is present, the film will have a grayish white color. It is washed with water and dried by heating the strip of zinc gently in an alcohol flame, and the copper will be indicated by its well known copper color. Under like conditions the film of tin is a dull grayish white. If copper and tin are both present, and it is desired to determine the quantity of the tin, the film is peeled off with a knife into a test glass and 5 to 8 drops nitric acid added. It is carefully boiled until entirely dissolved, when 75 drops ammonia is added, the solution shaken and allowed to settle. If tin is present, it will separate as amorphous oxide of tin in white flakes." We venture the suggestion that lead can be determined in a similar manner by precipitating on zinc.

Mineral Oils for Iron.

The use of heavy mineral oil as a preservative for iron is strongly recommended by the *London Oil Trade Review*, the substance referred to being, we presume, one of the products of shale distillation, so extensively practiced in Great Britain. Whether a similar product can be obtained from our petroleums is a good subject for research. Our cotemporary says:

The action of the oil is twofold. First, it is detergent when vigorously and freely brushed over an already rusted surface. It seems to loosen the bulk of the rust and it darkens that which remains. Secondly, it acts as a varnish if applied after the cleansing has been effected, or to new and bright work. Its superiority to vegetable or animal oils depends upon the fact that the bulk of the oil evaporates, and it leaves only a very fine film behind. If the oil is light and fully refined, it evaporates so completely as to do but little good in this way; but if tinged or "once run" oil of sufficiently high gravity be used, the resinous or carbonaceous matter which gives the tinge to the oil remains behind and



forms the thin protecting film of varnish. Ordinary varnish leaves far too thick and obvious a film, while the film of the once run oil does its work of protection without displaying itself. As regards the density of the oil required for this purpose, we recommend that which stands between the burning oil and good lubricating oil; it is known, and sometimes sold, as "intermediate oil." We are satisfied that a good trade may be done by anybody who will bring this before the public in a proper manner, and supply the article as required. For domestic purposes, for the cleaning of all kinds of household iron work, for the preservation of such things as mowing machines and other garden tools or exposed iron implements, the brown oil should be sold in small bottles at a cheap rate. For manufacturers of iron work and for ironmongers, to whom it will prove invaluable, it must of course be supplied in larger parcels. At present it can hardly be used at all, on account of the difficulty of obtaining it in retail quantities.

Ruled Test Plates for the Microscope.

In a recent paper read before the Quekett Microscopical Club, London, Mr. William Webb takes the ground that the alleged ruled plates of Nobert and others, purporting to present 200,000 lines to the inch, are illusions, it being a physical impossibility to cut any such number of distinct lines within such limits. He says:

That a micrometer with the lines the one 200-thousandth of an inch apart ruled on glass is an absolute impossibility. That if it be possible to rule lines themselves of the width of the one 200-thousandth of an inch, to make them definable there must be a clearly defined line between them, and a clearly defined line in the same plane of observation. That beyond the first few coarse bands of M. Nobert's tests, there is not, properly so called, a single line. That in the finest bands, except at their extreme sides, there is not half a line. That in the finest bands the only thing certain, except the edges, is the uncertain polarized aerial lines. That the microscopical world has been pursuing a phantom, and adopting a fallacy. That polarization of light in the examination of these and analagous tests is a deceitful servant of the microscopist.

That oblique illumination is another deceiver. That if M. Nobert were to attempt to fill his incisions with black, his finest bands would be merged each into one black line of the breadth of each particular band. That a test must be a known thing which some power will either disperse or fail to define, as in the case of a spectacle vendor, who places before an intending purchaser's eyes words printed in types of different sorts as a known test of visual powers. That there are no tests so reliable as a known measured congeries of contorted lines, as in microscopic writings, where the transmitted rays are partially shut off by the black, and in which, the rays transmitted being transmitted by direct illumination, their definition is not interfered with; such rays becoming parallel rays, passing out at right angles with the surface of the glass, the unalterable law of natural optics being that the angle of incidence and the angle of reflection are equal.

The Cincinnati Exposition.

The second Annual Exposition held in Cincinnati is now in progress, and attracting, on an average, some 12,000 visitors per day. We learn that it is the finest and largest display yet made in the West, and fully in accordance with what might be expected from a city inferior, in point of number and variety of its manufactures, only to New York and Philadelphia. Cincinnati alone furnishes one half the steam engines on exhibition, besides a fair proportion of the agricultural and labor-saving machines. There is also a large display of furniture of fine workmanship, coming from the various establishments of the city. Stoves occupy a prominent place in the list of local products; and from the manufacture, it seems probable that Cincinnati may fairly rival Troy and Pittsburgh. The makers of boots and shoes also carry on an extensive business, employing the most approved machinery and selling goods at the rate of $2,250,000 per year. Miscellaneous goods, and also leather, are exhibited in profusion. Of the latter the city makers, last year, produced $2,473,800 worth. There are from twenty to thirty different kinds of carriages displayed, the workmanship of which compares favorably with that of the best eastern firms. Pork packing is of course represented on a large scale. The figures of the past two years show a marked increase in this important trade. During the winter of 1870–71, there were packed 481,560 hogs, and in the succeeding winter, 630,301.

The Exposition is drawing large numbers of the country people to the city, and the attendance appears to be increasing in spite of the rival attractions of the Louisville Fair.

J. W. S. writes to say that he has a perpetual motion in running order, and he will dispose of it for $2,000,000 for a "plot;" but if he has to carry it to Washington, he will ask $5,000,000. The existing financial crisis will, we fear, prevent our correspondent from receiving either of the sums he mentions.

DURING last autumn, says the *Journal of the Society of Arts*, there were no less than seventeen companies extracting gold from the auriferous sand of Finland. One of the companies returned a dividend of 70 per cent. The largest nugget weighed 28 pennyweights.

Printing with Aniline Black.

When ammonia is added in excess to a solution of alum, a gelatinous precipitate is formed which consists of the hydrated oxide of aluminum. This hydrate is soluble in acids, acting in that case as a base, but it is also soluble in caustic soda and potash, when it acts as a weak acid and forms salts known as aluminates of soda and potash. The aluminate of soda can be prepared very cheaply, and is advantageously employed, according to Dr. A. Kielmeyer, for coating the cloth placed under the calico and running along with it. In calico printing a portion, of course, of the color or mordant employed passes entirely through the cloth which is being printed; and to prevent it from being deposited on the pressure rollers and returned to a clean part of the cloth upon the second revolution, it is customary to have a piece of thick woolen cloth (a little wider than the calico, running between the calico and roller to take up this excess) and to pass it over one of the heated cylinders; it is thus dried and can be used two or three times before it has to be cleaned. The great expense of these "travellers" and the labor of cleaning them has induced several calico printers to substitute a piece of the unbleached cotton cloth. After being used once it can be bleached and is in no way injured for calico, except in one particular case. A piece of unbleached muslin which has been soiled by aniline black cannot be entirely cleaned by the bleaching process, and, moreover, the fiber is injured. For this reason it has been necessary to adhere to the old method of expensive woolen "travellers" when using aniline black.

Dr. Kielmeyer has, however, made the interesting discovery that aluminate of soda mixed with scorched starch prevents the aniline black from attaching itself to the cotton. The alkalinity of this substance prevents the black from being developed; and at the same time, the solid hydrate of alumina is formed where aniline black and aluminate of soda come in contact, and protects the fiber by preventing the black from coming in contact with it. Attempts to employ the carbonate and acetate of alumina for the same purpose have not succeeded well; for although they check the development of the black, they do not form that insoluble layer which protects the fiber.

In preparing the goods, the unbleached muslin, as soon as it is singed, is passed twice through a cold solution of aluminate of soda of 4 or 5° B. It is left unrolled for two hours that it may become evenly distributed throughout the goods, and then dried on the hot cylinders. The cost of material for preparing a piece 164 feet in length is, in Germany, about 4 cents. For light patterns, like shirtings, it can be used over two or three times, for heavier ones but once; and if the pattern is very heavy, a solution of 10° B. should be employed. Before proceeding to bleach them, they are placed in a muriatic acid solution of 2° B. and washed. After bleaching there will be no trace left of the black. It has also been observed that the black patterns printed over this background do not strike through the goods so much as otherwise, and consequently the fabrics are not weakened so much; but upon the right side they are perfectly bright and full. Even this latter is of no small account when we remember that all aniline black, if never so carefully prepared, has more or less tendency to rot or weaken the fiber.

IMPROVED SHOEMAKER'S PINCHERS.

Mr. William H. Hanna, of Chico, Butte county, California, has recently patented, through the Scientific American Patent Agency, an improved form of shoemaker's pinchers, an engraving of which we herewith present.

It will be observed that the distance between the ends of the jaws and the pivot is considerably shortened, so as to secure greater power of grip. For the same purpose, the lever is extended beyond the extremity of the handle. On the under side of the lever is made a projection, so that the jaws act as a fulcrum against the last and thus preserve as large a range of movement as can be afforded with the ordinary instruments with much longer jaws. The upper lever is placed in about the same plane as the jaws, so that the line of draft coincides with the lever, and the lower handle does not come in contact with the last, as is commonly the case before the leather is sufficiently strained. The teeth abut against the turning face of the jaws so as to bring the bite near to the pivot, thus enabling the upper to be drawn as close as is desirable to the last. It is stated that there is no slipping off of the tool in cases of unusual strain and it is not liable to tear the leather or hurt the hand. Patented July 22, 1873. Further particulars will be found in the advertising columns of our present issue.

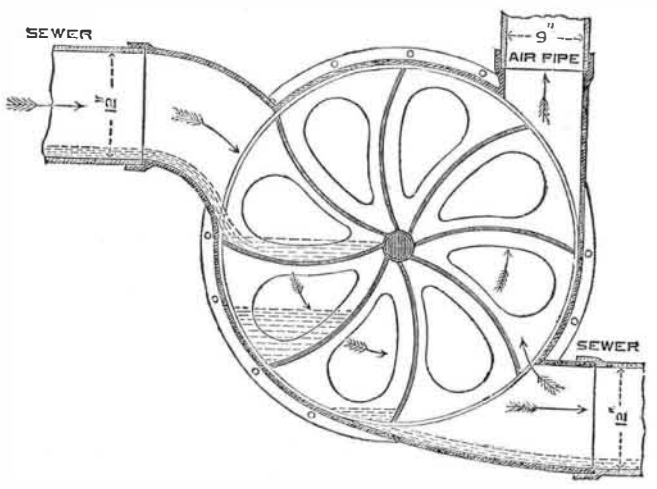
A Check to Railway Enterprises.

Among the bad effects of the recent financial crisis is the cessation of work upon unfinished railways and railway machinery in various parts of the country. Many thousands of laboring men have been suddenly thrown out of employment, and a winter of suffering appears likely to overtake hundreds of worthy families.

As an example of the mischief wrought by this unfortunate state of things, we may mention that the orders for locomotives at the Rogers works, Paterson, N. J., have been canceled and 600 men have been discharged. It is supposed that the principal locomotive shops will soon discharge several thousand men in the aggregate.

VENTILATION OF SEWERS.

The annexed diagram represents one of a series of fans placed in the line of a sewer, with an air pipe from it, supposed to be in connection with the atmosphere above the houses. It is the design of Mr. John Phillips, given in the *Builder*. By causing the sewage to fall into the fans on one side near the top and to escape on the other side at the bottom, they are made to rotate, draw air out of the sewer, and force it up the pipes into the atmosphere. The fans, therefore, are self-acting; and, if properly constructed and fixed, will not get out of order. If, in addition to the usual drain communications, pipes are laid from the open air into the sewer, at points midway or nearly so between the fans, it is evident that the air currents, established along the sewer by the rotation of the fans, will remove the gases as they



emanate from the sewage. Thus the power of the water flowing in the sewers not only carries off the sewage, but, by falling into the fans, with air pipes to and from the sewers in connection with the atmosphere, it is made available for ventilating the sewers as well.

Some New Phosphoric Compounds.

A. Gautier has prepared a singular compound of phosphorus with oxygen and hydrogen, which has the formula P_4HO. If a certain quantity of crystallizable phosphorous acid is sealed up in a tube with 5 or 6 times its weight of terchloride of phosphorus and heated to 79° C., hydrochloric acid and pyrophosphoric acid are produced. A bright yellow colored compound gradually separates, and can be obtained by first distilling off the excess of chloride of phosphorus, cooling the residue to—10° C., adding ice water, and then filtering. After washing on a filter, it is dried in a vacuum and then heated to 140° in a current of carbonic acid gas. The reaction is thus represented: $11PCl_3 + 27PH_3O_3 = 4P_4HO + 11P_2H_4O_7 + 33HCl$. When the reaction takes place at a temperature of 170° C., red phosphorus and pyrophosphoric acid are formed. The compound P_4HO is an amorphous body possessing a beautiful yellow color, insoluble in water, alcohol, ether, benzol, chloroform, oil of turpentine, glycerin, and acetic acid. It can be heated to 250° C. in dry carbonic acid without change. Heated in the air, it burns slowly with flame; mixed with chlorate of potash, it is exploded by percussion.

The same chemist has also obtained a compound whose formula is P_5H_3O, by mixing the biniodide of phosphorus, PI_2, rapidly with a large quantity of water. The new body is amorphous, of a pure yellow color, tasteless and odorless, and insoluble in any solvent. It is oxidized very violently by ordinary nitric acid, also by sulphuric acid. Heated in a current of dry carbonic acid to 135° C., it is decomposed, phosphuretted hydrogen being evolved. Ammonia forms with it a brown compound; but on neutralizing with hydrochloric acid, the original substance is restored. The properties of the body P_5H_3O seem to agree with those of solid phosphuretted hydrogen, P_2H, described by Thénard.

The Industrial Expositions.

The reports of the openings of the various industrial fairs throughout the country indicate the strong favor with which this graphic system of demonstrating the material progress of the nation is regarded by the people From all accounts, the number and variety of the productions displayed has never been exceeded during any previous year; nor does it appear that any single fair has, from the hour of its commencement, failed to attract throngs of interested visitors.

The Chicago Inter-State Exposition, a full description of the immense buildings of which (800 feet long by 200 feet in width), constructed through the generosity and enterprise of the citizens of Chicago, we have already presented, was recently formally opened, and during the first day of the exhibition 20,000 people entered its doors. Regarding the articles displayed, it is yet early to particularize. We learn that every department is complete in a full representation of the important arts and industries to which each relates, so that in our future references to this fair will doubtless be found descriptions of many novel and important inventions.

To the Kansas City and Cincinnati expositions, we have already alluded in detail. Both are succeeding admirably, and exciting no small interest in their respective vicinities. Indiana, in her State Fair now in progress at the Fair Grounds of her capital city, is making an excellent show of the manufactures and industries carried on within her borders. Louisville, Ky., celebrates a second Annual Exposition, and in St. Paul, the Minnesota State Fair was recently opened. In Baltimore, the 26th Annual Exhibition of the Maryland Institute, and in New Orleans, the Louisiana Fair, will afford the manufacturers of the Southern States a means of displaying local productions. Canadian industries will find representation in the Montreal Exposition and in the International Fair soon to be opened in Buffalo, N. Y. The excellent results of the experimental show of 1872, in Newark, N. J., has stimulated its projectors to new efforts, and we are promised an exhibition even superior to the very creditable one of last year. In Albany, we learn that the New York State Fair is attracting 20,000 people per day, and that the display of live stock, especially, has never before been equaled. In our own immediate neighborhood is the Kings County Fair, held in the Rink on Clermont avenue, in Brooklyn, and devoted to the local manufactures and industries of our sister city; while in New York is in successful progress the 42nd Exposition of that patriarch among fairs, the American Institute.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From September 6 to September 9, 1873, inclusive.

BLAST FURNACE.—T. F. Miner, Albany, N.Y.

ENGINE VALVE.—H. I. Hoyt, Norwalk, Conn.

FLOCK CUTTING MACHINE.—J. Pitts, Melville. Mass., *et al.*

Recent American and Foreign Patents.

Improved Pruning Knife.

Abraham C. Hulse and Joseph S. Crum, Palmyra, Ill.—This invention consists in constructing the parts of a pruning knife in such a manner that it may be quickly and conveniently changed from a shrub to a tree pruner or the reverse.

Improved Chain Clamp.

Charles E. Evard, Leesburgh, Va.—This consists in movable jaws, provided with rectangular recesses across the upper corners and horizontal chain rest, the said jaws when closed leaving an intervening open space large enough for the downward passage of the rivet.

Improved Ventilator.

John Ballou, Boston, Mass.—This is a frame in which a revolving ventilator is arranged so that the draft can be governed and light not be excluded. The device consists of four wings, two of glass and two of wire gauze, amounting to two planes set at right angles to each other. By a quarter revolution, the glass will be thrown into a horizontal position, and the perforated pieces will take its place, thus admitting air while excluding insects.

Improved Farm Gate.

Edward B. Decker, Carrollton, Ill.—This invention is an improvement in in the class of farm gates wherein the lower part may be raised and lowered independently of the upper part. Two lower bars are pivoted at their rear ends to one of the gate standards or cross bars. Their forward ends enter slots in the opposite cross bar. To one of the upper horizontal bars is attached a latch and hook, the latter of which, when the lower bars are raised, catches their forward ends and holds them up.

Improved Milk and Cream Cooler.

Henry C. Baldwin, North Wolcott, Vt.—The outer vessel of this cooler is provided with a spout upon its upper part for pouring in, and with a short pipe in its lower part for drawing off, the water. There is also an opening to allow the waste water to escape when a stream of running water is introduced into the spout. A ring flange is attached to the bottom of the outer vessel to support the inner vessel, so that there may be a water space between the bottoms, and has a number of holes to allow free circulation. To the outer vessel are pivoted hooks to keep the inner vessel in place when the water is poured in. The cover has ventilators to allow the air to circulate freely, the mouths of said ventilators being covered with wire gauze.

Improved Fluting Machine.

Edward M. Deey, New York city.—The first part of the invention consists of an arrangement of devices for adjusting the roller and regulating the pressure, whereby the roller which is raised to facilitate the adjusting of the goods can be raised without contracting the pressure springs. Less power is thus needed than is required to lift it against the springs. The second part consists of guides in connection with the roller to control it against lateral vibration. The third part consists in having the wheel by which motion is imparted to one of the rollers provided with and rigidly attached to a short shaft which couples with the roller, so that the latter can be removed without disturbing the wheel, and without the necessity of sliding the wheel off and on a portion of the roller.

Improved Steam Lubricator.

Reed A. Filkins, Cheshire, Mass.—It is proposed to have a hollow globe holder for the oil, having a hollow standard, with a conical enlargement of the hollow space at the lower end. This end screws into a hollow stand on the steam chest or journal box. A stationary conical plug projects upward from the bottom of the socket into the hollow of the lower end of the standard, so as to regulate the flow of oil by closing the mouth of said standard more or less, as the holder and standard are screwed up or down. The holder has a notched ring around its middle, which is graduated and numbered to show the extent of the opening of the feed at the mouth of the standard, and a spring click engages it to hold the oil holder to any position in which it is set. From the socket below the standard of the holder the oil enters a little chamber, in the middle of which a tube rises around the passage from said chamber into the steam chest to retain a quantity of oil in said chamber. In feeding, the oil will flow from the surface of the body contained in said recess, on the top of the tube, and down the inner surface of it, while the steam rises up in the center of the space. There is a valve which will screw into the proper passage and close it, so that the steam may be shut off at any time to allow of taking off the holder when it may be desired to do so.

Improved Breech Loading Fire Arm.

Daniel Hug, New York city, assignor to himself and William H. Speer, Jersey City, N. J.—This invention consists in a pivoted breech block, having a spring hook connected therewith and a cartridge extractor arranged centrally beneath the barrel, combined, to extract the old cartridges and throw them clear of the gun, as well as support the new one.

Improved Projectile.

James G. Hope, Wichita, Kas.—This invention is more particularly an improvement on the projectile for which letters patent were issued to applicant October 4, 1870; and consists in providing the stem of the projectile with a double set of guide wings, one for preventing its rotation during flight, and the other for causing it to describe a curve of greater or less radius.