

represented in the engraving. The color is applied evenly over the surface by a series of brushes, and then the paper is caught up in loops and carried by an endless chain over steam pipes, thus becoming dry as it slowly makes its journey of about four hundred feet. It is then reeled up and is ready for the printing. These grounding machines can carry two widths of paper simultaneously, so that the process is a rapid one. The "mica papers," to which reference has been made, are grounded in the same way as those in plain colors.

The next step is the printing. Our former article described the manner in which this is done by machinery. The annexed engravings show the operation of printing by hand. This is done in working off specimens, that effects may be determined and patterns fixed upon. It is done also in the production of special patterns, made to order, or in cases where the quantity to be printed would not warrant the expense of preparing the rollers for the machine. It is done also in those cases where the pattern is, as it were, built up by layer after layer of "flock," resulting in very rich effects. The process is clearly represented in the engraving. The pattern is cut upon a block of the width of the paper. This hangs upon a sort of crane, as shown in the illustration. The block is applied to a color sheet, and then is swung over and gently pressed upon the paper, the exact position being indicated by certain marks on the margin. The paper is moved along, there is a new application of color to the block and of the block to the paper, and so the work goes on. Of course but one color is printed at an impression. The same process must be repeated for each color, and therefore the work is slow compared with the machine printing. But the results are very elegant. The finest papers, the richest borders, and the like, are hand printed.

Some of the "leather" papers which we noticed in the wareroom have raised figures upon them. These papers, which are very thick and heavy, are stamped in a machine similar to other machines for the same general purpose. Some of the most gracefully elegant papers are embossed.

After the printing and gilding they are run through a simple machine, the essential parts of which are two rollers, an upper one of steel, engraved with the pattern desired—ribs, wavy lines, or reticulations of any kind—and a lower one of hard manila paper. With many patterns this embossing adds very materially to the effect. In some of the papers the gold or bronze, or other metal, is applied by hand. The portion to be bronzed is printed in varnish, as shown in the illustration, then it is liberally dusted over with the metal powder. When the superfluous powder is brushed off, the masses of gold, or silver, or bronze shine out, with the result of enhancing the beauty and effectiveness of the whole.

A Phosphor-Bronze Steamer.

A private trial trip of a steam launch called the Phosphor-Bronze, the property of the Phosphor-Bronze Company, Limited, London, lately took place in the Thames, off Westminster. This small vessel is built entirely of phosphor-bronze, and her length is only 35 feet, her beam being about 6 feet, and she attained a speed of 12½ miles per hour, which, considering her size, is a remarkable performance.

The chief object of the company in having so small a craft built was to test the rigidity of the phosphor-bronze sheet and angle pieces used in her construction, prior to having boats built on a large scale. The results have been beyond the company's expectation as regards rigidity and absence of vibration. As we understand, says *Engineering*, that the cost of phosphor-bronze boats will not much exceed those made of steel, and as the metal is not subject to corrosion like iron or steel, and also retains its value, we expect to hear soon of a further use of phosphor-bronze for steam launches, torpedo boats, etc.

Water in Steam.

Herr Stoupler, of Lucerne, Switzerland, by adding fluor-escence to the water of a boiler which by calorimetric tests enabled him to detect the presence of one half of one per

cent of water carried mechanically out of the boiler by the steam, found that from 2.3 to 4 per cent was actually thus present in the steam.

The deep green color of the water in the boiler was retained in it for weeks, and yet no trace of coloring could be detected in the water condensed in the steam cylinder, a proof that the water which gathers there is entirely due to condensation caused by the expansion of



HAND PRINTING.

steam, and that very little water is actually mechanically carried away by the steam from boilers.

Testing a New Magazine Gun.

The duplex field magazine gun was tried at Governor's Island the other day in the presence of General Hancock and a number of prominent officers and citizens.

The gun consists of two breech-loading rifle barrels, placed

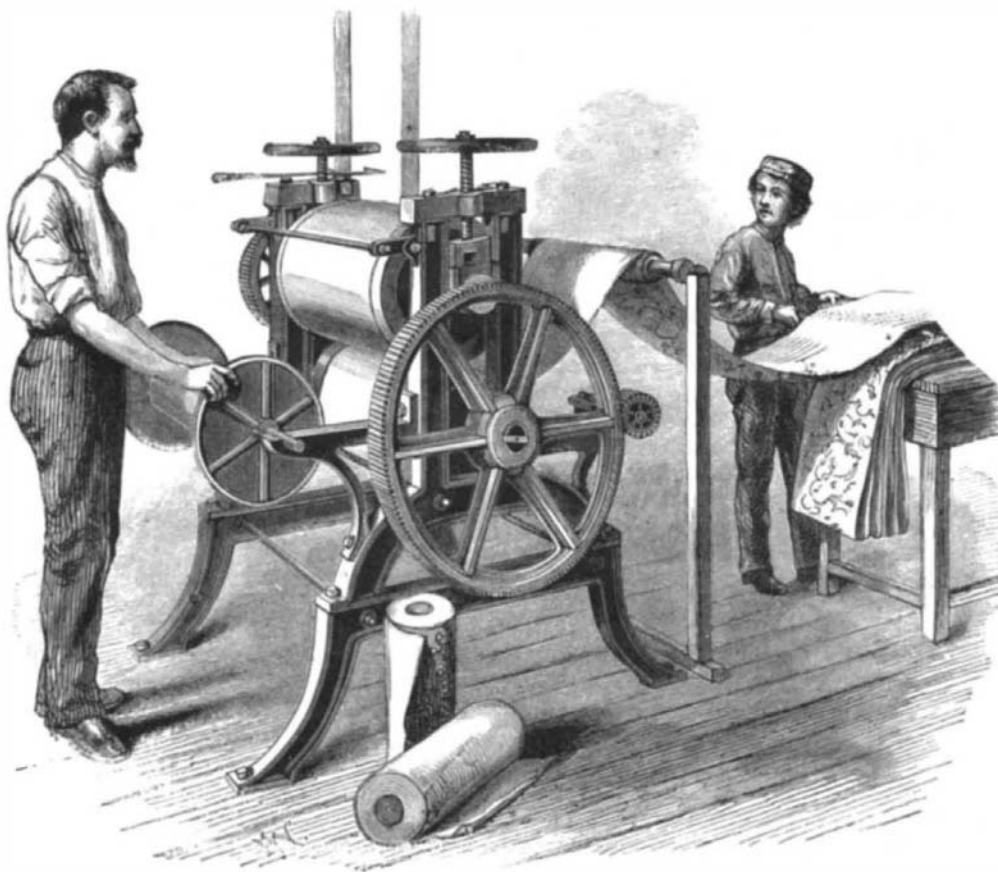
trace carriers, by which the trace carrier is free from all projecting parts for the reins to catch upon, and whereby also it can be readily attached and detached by detaching the back strap from the loop or frame, has been patented by Mr. Robert D. Whittemore, of Chippewa Falls, Wis. The object of the invention is to facilitate and cheapen the manufacture of harness and provide a convenient means for carrying the traces. The invention consists in constructing a combined

harness loop and trace carrier with a loop or frame having outer and inner bars upon the front, rear, and side parts to receive the harness straps, projecting pins upon its inner bars to hold the harness straps in place, and a rod having hooks formed upon its ends and a projection upon its middle part, whereby the cockeyes of the traces can be received and held, and are not liable to become accidentally detached, the cockeyes as they pass over the hooks causing the pressure of the back strap against the projection on the rod to force the ends of the hooks down against the loop or frame and to hold them there.

Mr. Michael Angelo McGuire, of Cincinnati, Ohio, has patented an improved trunk and valise frame. The object of this invention is to provide a frame for trunks, valises, satchels, etc., which is light and durable, and insures a good fit of the body and lid of the trunk or valise on each other. The frame of the body, and also the frame of the lid of the trunk or valise, is made of metal, shutting one down upon the other when the lid is closed, and each provided with a projecting rib on its inner surface. The leather, the edges of which rest against the ribs, is riveted to the inner sides of the frames and to inner metallic binding strips. The construction is a very serviceable one.

Mr. Benjamin O. Branch, of Friar's Point, Miss., has patented an improved

broiler, which is simple, cheap, and efficient. The object of this invention is to provide an improved device for broiling meats, etc., in front of a fire, so that the articles broiled shall not be flavored by the smoke from the fire. The invention consists of a disk having straight pins projecting from its face for holding the meat to be cooked, said disk being pivoted so as to revolve vertically on an upright standard whose lower end is secured in a pan which is designed to



EMBOSSING.

side by side in a brass case filled with water to keep them cool. The gun is operated by two men, one to feed and the other to discharge the cartridges, which is done by turning a crank. During the test 200 ordinary United States cartridges, 45 caliber, were first fired in 25 seconds. Then 100 were fired in 11½ seconds, and at the third fire the barrels were emptied of 500 cartridges in 68 seconds. The gun rotates on a swivel, and can be raised or depressed at any angle,

catch the gravy; and it consists, further, in having a funnel supported above the disk for the purpose of delivering the butter, etc., for basting the meat during the process of cooking.

Mr. James M. Brooks, of Columbus, Tex., has patented an improvement in seed planters in which the reciprocating seed-droppingslide in the bottom of the hopper has arranged over it a brush which serves to prevent said slide from carrying out of the hopper any more seed than is necessary or proper, and which brush is held in place by two catches secured to the hopper and arranged to grasp the head of the brush. One of these catches is stationary, but the other is made yielding or elastic, so that it can be sprung back to allow the brush to be put in and taken out when required.

An improvement in running gear for wagons, which operates very effectually to distribute shock to the gear and to reduce jerking of the shaft or pole connections, when traveling over ruts or rough roads, has been patented by Messrs. John M. Wadlington and Daniel Grace, of St. Joseph, Mo. This improvement refers more particularly to that class of wagons in which both forward and hind axles are pivoted at their centers and connected by cross rods or chains, and it consists in providing a wagon having said pivoted axles and connecting cross rods, with hind hounds extending forward for some distance from the rear axle to which they are attached, said hounds carrying a cross stop rod, which acts, in combination with the reach, to limit the movement of the axles and to prevent any rising of the rear hounds from the reach.

An improved wash boiler has been patented by Mr. Augustus E. Carson, of Livingston, Iowa. This boiler is divided horizontally by a partition arranged at a short distance above its bottom, into a lower steam generating chamber, and an upper water and clothes-holding space. A pipe situated outside of the boiler connects the lower compartment with the upper part of the clothes-holding space above, and at its entry within said space is bent downward to deliver the steam and water from the compartment below down on the clothes. The water is kept circulating in this direction by a knee pipe connecting the bottom portion of the upper chamber with the interior of the lower one, at the opposite end of the boiler to that on which the before-named pipe is arranged. This knee pipe is situated within the boiler, and is fitted with a valve to prevent back circulation; also with a perforated guard to exclude the clothes from entering it. The clothes are held down in the boiler by a weighted perforated plate. A wash boiler thus constructed becomes an automatic steam washer, that rapidly and thoroughly cleanses the clothes.

Mr. Constantine J. Brady, of St. Louis, Mo., has patented an improved smoke flue, which is intended to take the place of the brick chimneys in frame houses and to be built in the walls of brick houses, or it may be inserted in the chimneys or smoke flues of houses already built. Said flue is made of sheet or cast iron, and is preferably square in cross section. Its lower portion is bent and presents an open end, which is inside the house a short distance above the floor, and may be closed by a sliding door. This lower portion forms a soot chamber, and said flue is provided at different points in its height with suitable stove pipe connections. Such improved flue is practically self-cleaning, and the soot as it collects in the chamber below may readily be removed.

An improved attachment for raising and lowering carriage or buggy tops, which may be operated with facility by the occupant of the vehicle from the seat thereof, has been patented by Messrs. Emanuel Fleck and John Boyd, of La Grange, Ind. The attachment comprises a hand lever pivoted to the end of the seat or railing, and provided with a pivoted locking lever having at its lower end an eccentric, which rests against the edge of a semicircular plate attached to the end of the seat or railing. To this hand lever a jointed lever is pivoted, which has its one end attached to a rod connecting the jointed braces of the buggy top. When the hand lever is turned toward the back of the seat the jointed braces will be folded and the carriage top lowered.

An improved car coupler, which is self-coupling, has been patented by Mr. Joel Ren, of Parrottville, Tenn. The invention consists of a horizontal pincher-like pair of clamps pivoted above the draw-head of a car on a suitable support, with the long legs of the clamp extending forward and carrying a sliding ring, and the jaws or short legs directly above the coupling pin aperture in the draw-head in position for grasping the coupling pin; and, further, of a horn or a rod bent at right angles, fixed in and projecting from the end of an opposite car, whereby, when the cars approach each other, the clamp may be opened to release the coupling pin, that the latter may drop into the draw-head and hold the coupling link.

In adjustable dental chairs in ordinary use the crank arm or web requires to be frequently turned, and if left on the crank shaft it is constantly interfering with the movements of the operator in passing around the chair, and consequently the crank must be removed, to be replaced again for making any change in the adjustment of the chair. This frequent removal and replacement occasions much loss of time and inconvenience. This objection is overcome by an improved dental chair crank recently patented by Mr. C. Edmund Kells, Jr., of New Orleans, La., in which the crank arm or web is adapted to be rotated upon or around a pin which projects from the boss of the crank, and is capable of being set and held in any desired position in relation to the crank shaft without removing the crank, and whereby it may be turned entirely out of the way of the operator.

The Ventilation of Long Tunnels.

Herr Wilhelm Pressel has circulated a lithographed paper on this subject among his friends and colleagues; and as it is a question of daily increasing importance, we reproduce his most important suggestions. He begins by pointing out that the direction and intensity of the current of air in a tunnel are the product of numerous factors, that is, the length and dimensions of the tunnel, difference in level of the two mouths, average temperature in the tunnel, temperature of the external air at the mouths, pressure and moisture of the same, direction and strength of the prevailing wind. The effect of the latter group of factors may be either to intensify or to neutralize the natural action of ventilation set up by a difference between the level of the two mouths. The interior of a tunnel situated in a high mountain district, and passing under a vast mass of rock, will always be warmer than the outside air, especially at night, when in the Alps the temperature always falls. The warm internal air will, therefore, ascend the slope, and issue at whichever mouth is highest, and the cool air be drawn in from without to supply its place. Evidently this natural ventilation will be stronger in proportion to the difference of level of the two mouths. But the increase of this difference means increased steepness in the tunnel, and consequently increased production of smoke, and an intensifying of the evil to be cured. Moreover, as was before said, an unfavorable combination of external circumstances may destroy all the benefit to be derived from a steep gradient, and leave only the ill effects. This is the case at the Mont Cenis, where the difference is so great as 140 meters (nearly 460 feet), but where the natural current is from these causes extremely weak, and often fails to produce any through draught at all, the smoke merely shifting backward and forward, than which nothing can be worse. Nor has the mechanical ventilation succeeded in supplying the deficiencies of the natural. Herr Pressel states that the loss of power in the air-compressing machines is so great that, instead of sweeping out the tunnel, they barely succeed in sending their current sufficiently far into the interior to keep the refuge chambers for the employees clear of smoke; and the apparatus more lately erected for pumping out the vitiated air is very ineffectual. He therefore concludes that natural means are insufficient for the ventilation of long tunnels, and that mechanical means have failed, and proposes instead a system not hitherto tried. It is obvious that a current is caused by varying specific densities of air at various places, the heavier air being drawn along (popularly speaking) to take the place out of which the lighter has arisen. If then a distinct difference can be established and maintained between the specific gravities of the air at the two ends of the tunnel, a steady current can be relied upon. This may be done by condensing the air at one end or rarefying it at the other, or doing both together. The second plan has often been adopted. Shafts have been sunk into the tunnel at each end, and the air in one has been kept heated by fires, so that there was a continual indraught of outside air through the other. The objections to this method for long Alpine tunnels are, first, the expense of the apparatus and fuel when used on such a large scale; and, secondly, the radiation of heat from the walls of the tunnel itself, when this is pierced through an immense mass of rock, which makes it necessary that the air brought in should be not only pure but cold. The author proposes therefore to adopt the reverse process, and cool the air in one of the shafts by means of falling water. Railways always approach Alpine tunnels along high valleys, which invariably contain mountain streams of very low temperature. The means of refrigeration are therefore at hand. Herr Pressel considers that a stream of about one hundred gallons per second falling through the shaft would cool the air sufficiently and establish the current, for which he believes that a difference of temperature of ten degrees Cent. between the two shafts would be all that would be necessary. The upper openings of the shaft should be protected by revolving iron shields from the disturbing effects of wind on the ventilation. The mouths of the tunnel should be closed to allow this system to work properly, but need not be absolutely shut. Arrangements should be made for closing the shafts, and either wholly or partially shutting off the water supply, and there should be a special system of telegraphic signals for the purpose, so as to keep the whole system under control and enable it to be worked according to the varying conditions of the atmosphere. In very cold weather the supply shaft should be closed altogether, and the corresponding mouth of the tunnel opened, when the cold air will flow in of its own accord.—*Engineering.*

Automatic Freight Car Brakes.

After each war of passenger and freight rates between competing lines is over, and new figures are agreed upon, we notice that there is always a shrinkage in price from the previous rates which ruled before the war commenced. The question is naturally sprung: How are roads enabled to stand a continued reduction in rates? They pay no less for labor of any class nor for supplies of any kind. They have the same, or perhaps increased fixed charges to meet, and the same dividends to earn or to promise. How then can they make both ends meet, and submit to these successive cuts in prices? We answer that one very important reason is because of increased facilities every year arising from improvements in rolling stock, motive power, and roadway. Improved platforms and couplers, air and vacuum brakes, electric signals, paper wheels, safety switches, etc., permit increased speed with greater safety to their passenger trains,

while heavier steel rails, better ballasted road beds, lessened gradients, and more powerful locomotives reduce the cost per ton per mile of moving freight trains. This latter cost will be still further very materially lessened as soon as a thoroughly practicable, independent, self-acting, automatic freight train brake shall have come into general use. Not only will the cost of moving of freight be lessened, but the immense losses by wrecks be greatly reduced by such an appliance. But it must be one that shall meet the requirements of railway freight management, namely, simplicity, durability, and cheapness, not only of first cost, but of cost of maintenance and repair.

What railway men want to-day is an automatic device in the form of a brake for freight trains, which shall produce the greatest results with the fewest number of pieces, which by reason of its simplicity shall require the minimum amount of care and attention, which shall be in all respects automatic and requiring no other connection between cars than the ordinary link and pin to make it effective, and at all times operative.

The more complicated and intricate the appliance, of course the greater the first cost and cost of maintenance. An automatic freight car brake which gives the engineer the control of his train when moving forward only, if simple, cheap, and durable, will always take precedence over a more extended and comprehensive device that would enable him to control it in moving backward also, for no train will ever be run backward at a speed which the engineer cannot control with his engine. It is the enormous loss of property, which is to-day the result of collisions, both head and rear, and the numerous, now unavoidable accidents incident to suddenly coming into danger while moving forward, with no means to check the heavy train going at even a moderate rate of speed except the unreliable appliances now in use, that railway managers are most anxious to save and avoid. They do not fear the accidents which may result from moving backward. This is the problem to be solved. How near are we to its solution? Every morning paper which we take up, with its record of loss of property and life, tells how badly such an improvement is needed.

Every railway manager is anxious to make his present freight equipment earn a greater income by shortening up the schedule of his freight trains, provided he could do it with any show for safety. Who has made any substantial, well authenticated developments in this direction? We have heard a great deal about trial trains, experimental stops, etc., with this or that device, but who can show results which have been obtained by constant service, even of a reasonable number of months upon a reasonable number of cars? Don't all speak at once!—*Railway Register.*

No Organic Matter in Meteors.

A Louisville (Ky.) paper reports an interview with Prof. J. Lawrence Smith, of that city, in the course of which Mr. Smith gave reasons for discrediting the discovery of organic substances in meteors, as claimed by Prof. Hahn, of Berlin. Mr. Smith said

"Although I have probably examined more microscopic plates of fragments of meteorites than any other person, still I have never discovered anything like organic remains in any of them. Besides, the well known chemical composition of these bodies is averse to the existence of any such remains as spoken of by Prof. Hahn. Were these remains present we should discern carbonate of lime on their interior. The two or three that have any carbonate of lime were discovered and analyzed by myself, and in these cases the carbonate of lime was an accidental constituent of incrustation deposited on the surface after their fall. In the microscopic examination of these polished plates of meteorites the two predominating minerals, enstatite and bronzite, will, by their fissures and forms, sometimes remind one of vegetable and other organic forms, but the merest tyro of an observer will trace here nothing but a rare resemblance. And, furthermore, the very ingenious nature of these minerals precludes the possibility of organic remains even in terrestrial minerals of similar kind. Not knowing of any eminent German geologist named Prof. Hahn, I thought it but reasonable and logical that I should inquire something about him from my friend Prof. Hawes, now in the employ of the Smithsonian Institution, and the best lithological microscopist in this country, and who recently returned to this country after ten years' study with Prof. Rosenbaum and others into the microscopic character of rock. In answer to my inquiries Prof. Hawes wrote me this letter:

"I read that paper of Prof. Hahn's. He is a kind of half-insane man, whose imagination has run wild with him. These forms which he so accurately describes and figures have long been known to exist in meteorites, and have been frequently described by mineralogists and microscopists. They are mainly composed of enstatite or bronzite in radial forms, and fractured in such a peculiar manner as to give them the appearance of structure. Some of the American meteorites which I have examined show these forms in great beauty, but Prof. Hahn is the only man who has seen anything organic in them, and his paper has excited nothing but ridicule. It reminds one of the long and laborious research of a German professor who found a whole flora and fauna which he named with double Latin names, and which he found in his microscopic examination of basalt." "It is very clear to my mind," continued the Professor, "that these cranky observations, viewed with the spectacles of the imagination of Prof. Hahn, have obtained more publicity than they merit."