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Improvement in Portable Forges.

Portable forges, from their neatness of construction and handiness in operation, have in a great many cases belied their name, and become welcome fixtures in shops and manufactories. In our experience as a manufacturer of machinery and tools, we always gave them the preference, especially for light work, and used them rather than the unsightly masses of brick, cinders, and ashes, generally dignified with the name of forge, structures which are a perpetual eyesore to the tidy workmen. But we have never yet seen an apparatus that seemed to fulfill the requirements of a portable forge so fully as that which is herewith illustrated. The whole apparatus, with its adjuncts, is contained in a chest thirty-one by twenty inches, and weighing but one hundred and fifty-seven pounds. A very few minutes suffices to convert this chest into a perfect operative forge, and when it is necessary to remove it to another point, as in bridge building, repairing railroads, etc., the parts may be separated and packed for removal or transportation with equal celerity. The legs are removable, and with all the other pieces are held in appropriate places provided for each in the chest; the hearth, bonnet, wind pipe, and other appliances, being contained in the same receptacle. When in use, the cover of the chest forms a support for the forge back and bonnet, and a fulcrum for the bellows lever, while the bellows is allowed free play by the lowering of one end of the chest bottom.

For the army, especially when on a march, for emigrant trains crossing the plains, for railroads, for dentists, silversmiths, bridge builders, and others, and on steamboats and ocean steamers, this portable forge is specially adapted. It has received the approval of United States army officers, after thorough trial at the government shops in Washington.

It was patented Dec. 27, 1864, through the Scientific American Patent Agency. Further information may be obtained by addressing the patentees, Samuel Rohrer or Wm. Carson, Palmyra, Mo. [See advertisement on another page.]

ROHRER'S PATENT PORTABLE FORGE.

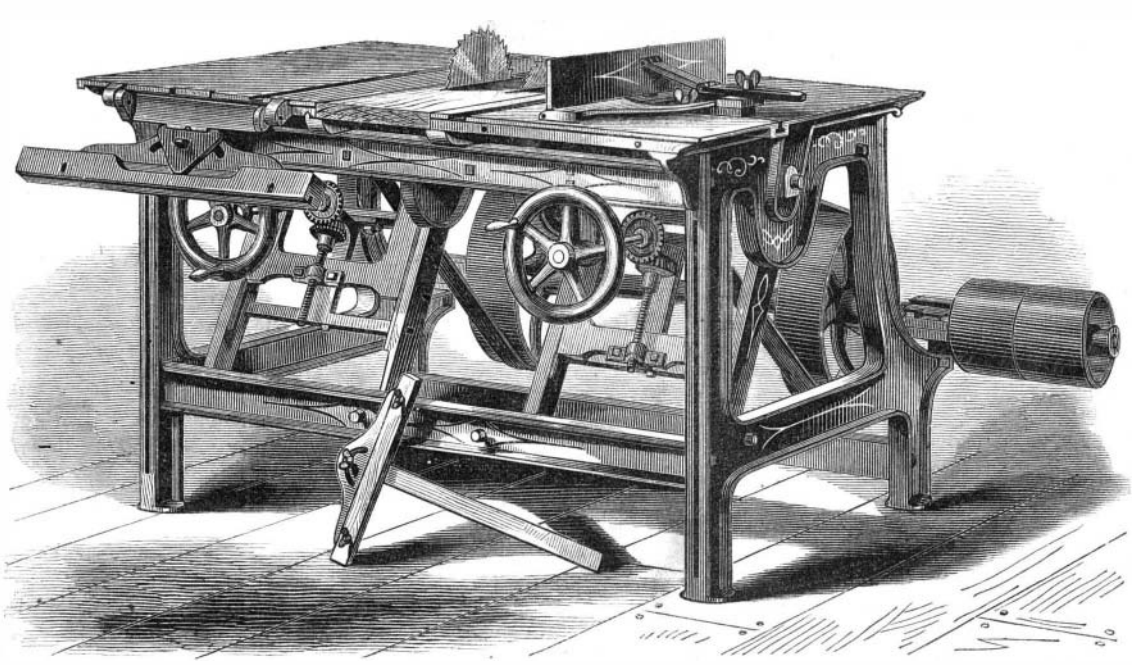
Sawing and Grooving Machines.

The usual method of adjusting the depth of cut of bench saws or grooving heads is to elevate one side of the table to the requisite incline, while the saw or cutter arbor remains fixed in one position. There are objections to this method of adjustment which must frequently have suggested themselves to practical workmen. The incline of the surface of the table interferes with the accuracy desirable in doing the work, as it demands more care in the guidance of the material to be worked; and the table thus alternately raised and lowered tends to become unsteady and liable to vibration, producing inferior and faulty work.

The machine shown in the engraving operates in an entirely different manner. Instead of the table being adjusted to the saws or cutters, they are raised or lowered to meet the demands of the work. The saws or cutter heads are secured to arbors, which run in boxes attached to a sliding frame under the table, mounted on another frame set on an angle with the upright and horizontal portions of the machine. The arbor frame with its saw or cutter head is elevated or depressed by a screw worked by bevel gears and a hand wheel, the latter projecting from the front of the machine. The incline is at such an angle with the center of the driving shaft at the rear of the machine, that in any position of the arbors the belts will always be kept tight. The splitting rest or guide is jointed so as to be inclined at any angle to saw at any bevel desired, and can be readily removed to permit the cutting of long stuff. The squaring guide is hinged to the table and can be turned up on the table for use, or allowed to drop, as seen in the engraving, so as to be out of the way when not required. It is so constructed as to swivel for cutting miters either way. A light guide, also made to swivel, seen resting against the front of the machine, can be used for light work, its stem traversing a transverse groove in the table.

These machines may be made double, as in the illustration, or single, as required, and may be used for splitting, squaring, mitering, or grooving. Being of iron, they are solid, enduring, and exact, complete without countershafts, and requiring no braces to keep them in place. By practical wood workers they are highly commended.

The patent was issued to Jonathan P. Grosvenor, of Lowell, Mass., and bears the date of May 5, 1868. Address, for further information, the patentee as above.



GROSVENOR'S PATENT SAW BENCH.

JUNE-BUGS are so plentiful in France that they are captured in large numbers and from their bodies is expressed an oil said to possess great value as a lubricant.

A Useful Official.

In the new building of the Department of Agriculture, at Washington, the happiest being will be our enthusiast, Townsend Glover, the naturalist, to whom our farmers apply for a knowledge of what birds eat the pippin apples, and what worm gets into the beet root. Glover is a Brazilian by the accident of birth, a Yorkshire Englishman by parentage, a German by education, American by adoption and enthusiasm. He is a singular looking man, short, thick, near-sighted, peculiar, an Admirable Critchton in the practical arts. Agriculture has been his fanaticism for forty years. He paints, models in plaster, engraves, composes, analyzes, and invents with equal facility. His passion is to be the founder of an index museum to all the products of the American continent from cotton to coal oil, from pitch pine to wine. Heretofore he has had only two little rooms in the dingy basement of the Patent Office; hereafter he is to have a handsome museum room in the new building, 103 by 52 feet and 27 feet high. His objects, already largely perfected, are to methodize, by models and specimens, the natural history, diseases, and parasites, remedies of every individual product in America. For example: A man wants to move to Nevada. What are the products of Nevada? Glover has a series of cases devoted to that State, models of all its fruits, berries, prepared specimens of its birds, illustrations of its cereals, flora, grasses, trees. A small pamphlet conveys the same information; the man knows what to expect of Nevada. A man forwards a blue bird; is it tolerable or destructive, to be encouraged or banned? Glover forwards the names of fruits, etc., which the blue bird eats. He will show you, in living, working condition, the whole lifetime of a cocoon; the processes of Sea Island cotton, from the pod to the manufacture; the economical history of the common goat; the processes of hemp, from the field to the hangman. Every mail brings to him a hawk, a strange species of fish, a blasted potato, a peculiar grass which poisons the cow. He is the most dogged naturalist in the world, probably; a wrestler with the continent. He is a bachelor, married to his pursuit—one of those odd beings hidden away in the recesses of government, whose work is in itself its own fame and fortune.

Speed of the Senses.

There are thirty one pairs of compound nerves in the human body, the sensory and motor fibers of which are so commingled as to render it an impossible undertaking to separate them by any means at present known. Now if, for instance, a needle be stuck into one of the fingers, the sensory fibers take the impression through the nerve and the posterior root to the spinal cord and thence to the brain. The command goes out to "draw the finger away." The mandate travels down the spinal cord to the anterior root, and thence through the motor fibers of the nerve to the muscles, which immediately act, and the finger is at once removed. All this takes place with great rapidity, but yet with nothing like the celerity once imagined.

The researches of Helmholtz, a distinguished German physiologist, have shown with great exactitude the rate of speed with which the nerve fluid travels; and other observers have given a great deal of time and patience to this and kindred questions. As the result of many deliberations, it was ascertained that the nervous fluid moves at the rate of about 97·1 feet in a second. Now electricity travels with a speed exceeding 1,200,000 feet in a second, and light over 900,000,000. A shooting star moves with a velocity of 200,000 feet in a second, and the earth, in its orbit around the sun, 100,000. A cannon ball has a mean velocity of 1,800

feet in a second; an eagle, 130; and a locomotive, 95. We thus perceive the nervous fluid has no very remarkable rate of speed—a fact which, among many others, serves to indicate its non-identity with electricity.

Prof. Donders, of Utrecht, Holland, has recently been making some interesting experiments in regard to the rapidity of thought, which are likewise interesting. By means of two instruments, which he calls the noematachograph and the noematachometer, he promises some important details. For the present he announces that a simple idea requires the brain to act for sixty-seven one thousandths of a second for its elaboration. Doubtless the time required is not the same for all brains, and that, by means of these instruments, we may obtain definite indications relative to the mental caliber of our friends. What invaluable instruments they would be for nominating caucuses for vestries, for trustees of colleges, for merchants in want of bookkeepers; in short, for all having appointments of any kind to make.

For the eye to receive an impression requires seventy-seven one thousandths of a second, and for the ear to appreciate a sound, one hundred and forty-nine one thousandths of a second are necessary. The eye, therefore, acts with nearly twice the rapidity of the ear.—*Galaxy.*

PUBLIC RIGHTS AS AFFECTED BY OPERATIONS OF RAILROAD MONOPOLISTS.

It is well that recent attempts of certain stock-jobbing cliques, headed by men notorious on account of vast wealth, and acknowledged superior skill in controlling the stock market to enrich themselves, have begun to enlighten the people in regard to the extent to which such abuses may be carried, and to demonstrate the wisdom of limiting the powers hitherto granted by legislative action to railroad corporations. They have obtained their power by the abuse of franchises originally obtained from the representatives of the people, through companies in which, by a series of adroit manipulations, they have succeeded in obtaining a controlling interest.

The general indignation which pervaded the public mind, when certain arbitary restrictions in regard to the shipping of freights over the New York Central railroad were inaugurated, seems to indicate that further imposition might exceed the limit of that forbearance which appears to have been so confidently relied upon in the management of railroad and and express monopolies in this country. We are greatly deceived, however, in our estimate of the character of the men who originated and developed the gigantic schemes which have recently created such wide spread apprehension, if the apparent present suspension of attempts to carry out the original plan in all its essential features shall prove to have been finally abandoned. We believe, therefore, that measures should at once be adopted that would immediately and permanently stop all attempted encroachments upon the rights of the public, by the acts of these financial autocrats.

The following exhibit of the manner in which the capital stock of the Hudson River railroad was increased from its original amount, and also of the way in which it was proposed to increase the capital stock of the Harlem and New York Central railroads, is taken from the *Atlantic Monthly*:—

Present capital,—Hudson.....	$14,000,000
Bonds outstanding Jan. 1, 1868.....	5,000 000
Present capital,—Harlem.....	6,800,000
Bonds outstanding Jan. 1, 1868..... ...	5,000,000
Present capital,—New York Central...	28,990,000
Bonds outstanding Jan. 1, 1868.....	11,347,000
Giving in sum total.....	$71,137,000

The fourteen millions credited to Hudson in the above summary represents only ten and a half millions of actual money, and owes its creation to one of those peculiar financial expedients by which shrewd American capitalists acquire the enviable title of railroad kings. When the head of the dynasty which now dominates over the three affianced companies made his first move by securing possession of the river route, he inaugurated a system of economical management, special traffic arrangements, and vast construction outlays which afforded a specious pretext for augmenting the capital stock. It was therefore voted that the then capital of seven millions should be increased to fourteen by an issue of bonus shares at fifty per cent. Each stockholder paid in fifty dollars, and received scrip, the par value of which was one hundred, but which sold in Wall street at forty-five premium. This splendid maneuver, by which the company obtained three and a half millions for the construction and repair fund, while the stockholders doubled their money, presented features too large and captivating to lapse into desuetude. It was now proposed to repeat the same operation along all the lines, which at the same time were to be consolidated. The scrip dividend in this second scheme was to be 33⅓ per cent.

This would give:—

Fresh capital,—Hudson.....	$6,000,000
" " Harlem.....	3 200,000
" " N. Y. Central.....	9,663,000
With previous sum total of capital.....	71,137,000
Capital of consolidation.....	$90,000,000

In order that dividends might be realized upon this large increase of stock, the restrictions upon the shipping of freights above alluded to were initiated, and an increase of rates for passenger travel and upon goods in bulk was determined upon. To compel the public to submit to such exactions, it was necessary to destroy competition, and to this end the securing control of the Erie Railroad was deemed necessary. The battle for supremacy was hotly waged between the two greatest stock operators this country has ever known, Messrs. Drew and Vanderbilt. Small operators who had not the good sense to shun danger were mercilessly crushed, and the financial interests of the country were greatly disturbed by the conflict. After days of suspense it at last became apparent that Mr. Drew was more that a match for Mr. Vanderbilt and the latter executed a masterly retreat, which left him apparently little worse for the conflict, and, we are confident, disposed to renew it whenever the opportunity seems favorable.

The developments of this celebrated struggle were such as to give birth to great apprehensions for the future welfare of the commercial interests which so largely depend upon the proper and just management of all the avenues of trade which radiate from the city of New York and connect it with the other commercial centers of the Union. It was seen that legislatures and courts were made the instruments of these powerful organizations, and that corruption had been carried to an unparalleled extent by unscrupulous agents of the opposing powers. Not these only were found to be adopting such means to attain their ends, but an examination of the contingent expenses of different railroad companies revealed the fact that astounding sums were paid for the manipulation of legislative bodies. "The Union Pacific paid not less than $500,000 for services rendered to the company by lobbyists at Washington. It recently cost the Missouri Pacific Railroad $192,178 to secure the possession of that road by State legislation. The New York Central credits $250,000 to the contingent fund for expenses at Albany in 1866–67. In view of these facts it seems just to modify the popular prejudice against the Camden and Amboy Railroad, which has certainly attained its ends in congress and at Trenton by a far more economical expenditure."

It is much easier to find fault with the existing state of things than to suggest the proper remedy. We believe that the present system of granting charters to corporations is mischievous in its effects so far as it relates to franchises which involve such large and general interests as public highways, canals, and railroads. At least the government should retain the power to assume the control of all such internal improvements by paying the companies their real value, at any time that their defective management seems to call for such a procceding. A railroad thus removed from the control of those who desire to make it the means of public extortion might be conditionally leased to another company, or operated by the government itself. We admit that certain objections might be raised against this system, but we think that when compared with the advantages which would be derived from it, they would be found neither so numerous nor so formidable as might at first be anticipated.

Some means must be devised by which officials can be cured of their speculative tendencies; we care not what, so long as they answer the purpose, and provide for the proper punishment of any railroad official who deals directly or indirectly in railroad scrip. The suffering of a road to become so shamefully out of repair as the Erie has notoriously been, should be sufficient cause for the removal of its officials and the appointment of suitable persons to fill their places by the government.

That the existing laws under which railroads are organized and operated need thorough revision, seems the inevitable conclusion of a candid and careful consideration of the subject. That delay is fraught with danger also seems certain. We trust that the public will be aroused to timely action upon this matter, and that the possibility for any one man to obtain hereafter the control of any internal improvement, which affects directly every individual in the commonwealth, shall be forever terminated.

Science Familiarly Illustrated.

Gunpowder---Its Manufacture and Uses.

Gunpowder is a solid, explosive, mixture, composed of niter, sulphur, and charcoal, reduced to powder, and mixed intimately with each other. The proportion of the ingredients varies very considerably; but good gunpowder may be composed of the following proportions:—seventy-six parts of niter, fifteen of charcoal, and nine of sulphur, equal to one hundred. These ingredients are first reduced to a fine powder, separately, then mixed, intimately, and formed into a thick paste. This is done by pounding them for a long time in wooden mortars, at the same time moistening them with water, to prevent the danger of explosion. The more intimate is the mixture the better is the powder; for, since niter does not detonate except when in contact with inflammable matter, the whole detonation will be more speedy the more numerous the surfaces in contact. After the paste has dried a little, it is placed upon a kind of sieve, full of small holes, through which it is forced. By that process it is divided into grains, the size of which depends upon the size of the holes through which they have passed.

The powder, when dry, is put into barrels which are made to turn round on their axis. By this motion, the grains of gunpowder rub against each other, their asperities are worn off, and their surfaces are made smooth. The powder is then said to be glazed. The granulation and glazing of the powder causes it to explode more quickly, perhaps, by facilitating the passage of the flame among the particles.

When gunpowder comes in contact with any ignited substance, it explodes, as is well known, with great violence. This effect may take place, even in a vacuum. A vast quantity of gas, or elastic fluid, is emitted, the sudden production of which, at a high temperature, is the cause of the violent effects which this substance produces. The combustion is, evidently, owing to the decomposition of the niter by the charcoal and sulphur. The products are, carbonic oxide, carbonic acid, nitrogen, sulphurous acid, and, probably, sulphureted hydrogen. Mr. Cruikshanks has ascertained that no perceptible quantity of water is formed. What remains, after the combustion, is potash, combined with a small portion of carbonic acid, sulphate of potash, a very small proportion of sulphuret of potash, and unconsumed charcoal. But that water is produced by the explosion of gunpowder is proved by its presence in the piece after it has been fired. A sufficient quantity is developed to moisten and foul the bore of the piece, and necessitate its cleansing, and to hold *in transitu* the unconsumed portions of the charcoal, or other ingredients. Every practical gunner or expert with the rifle or pistol knows that every discharge of common gunpowder develops more or less of water; else why the cleansing of cannon or gun barrels, after successive discharges, when they become fouled by the remains of the discharges? Explosion releases the water held in combination with the components of gunpowder, as well as the ligbter gases. The explosion of gunpowder is as surely a means of liberating the combination of hydrogen and oxygen as of liberating the nitrogen and carbonic acid.

We need a gunpowder, or something to take its place, which will not develop miosture to foul the bore of the gun. Such a discovery we believe to be within the limit of inventive talent.

The elastic fluid which is generated when gunpowder is fired, being very dense, and much heated, begins to expand, with a force at least one thousand times greater than that of air under the ordinary pressure of the atmosphere. And, allowing the pressure of the atmosphere to be fourteen and three fourths pounds upon every square inch, the initial force or pressure of fired gunpowder will be equal to at least fourteen thousand seven hundred and fifty pounds upon every square inch of the surface which confines it. But this estimate, which is that of Mr. Robins, is one of the smallest which has been made. According to Bernoulli, the initial elasticity with which a cannon ball is impelled is, at least, equal to ten thousand times the pressure of the atmosphere; and, from Count Rumford's experiments, it appears more than three times greater than this.

Gunpowder, on account of its expensiveness, and the suddenness and violence of its action, is not employed as a regular moving force for machinery. It is chiefly applied to the throwing of shot, and other projectiles, and the blasting of rocks.

When a ball is thrown from a gun, the greatest force is applied to it, by each particle, at the moment of its explosion. But, since the ball cannot at once acquire the same velocity, with which the elastic fluid, if at liberty, would expand, it continues to be acted upon by the fluid, and its motion is accelerated, in common cases, until it has escaped from the mouth of the piece. The accelerating force, however, is not uniform; and hence, the following circumstances deserve attention:—1. The elasticity is, inversely, as the space which the fluid occupies; and therefore, as it forces the ball out of the gun, it continually diminishes. 2. The elasticity would diminish, in this ratio, even if the temperature remained the same; but it must diminish in a much greater ratio, because a reduction of temperature takes place, both from the dispersion of the heat, and the absorption of it, by the fluid itself, during its rarefaction. 3. The fluid propels the ball, by following it, and acts with a force that is, other things being equal, proportionate to the excess of its velocity, above the velocity of the ball. The greater the velocity the ball has acquired, the less, therefore, is its momentary acceleration. 4. From this change of relative velocity, there must be a period when the velocity of the ball will exceed that of the elastic fluid; and, therefore, the proper length for a gun must be that in which the ball would leave the mouth at the time when the velocities are equal; and all additional length of the piece, beyond this, can only serve to retard the ball, both by friction and atmospheric pressure.

The force of fired gunpowder is found to be very nearly proportionate to the quantity employed; so that, if we neglect to consider the resistance of the atmosphere, then the hight to which the ball will rise, and its greatest horizontal range must be, directly, as the quantity of powder; and, inversely, as the weight of the ball. Count Rumford, however, found that the same quantity of powder exerted somewhat more force upon a large ball than on a smaller one.

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

Explosive Gases in Steam Boilers.

MESSRS. EDITORS:—Almost every one practically conversant or theoretically acquainted with steam boilers, has his theory of the cause of explosions, which he adapts to any and all cases; and this may account for the singularly contradictory evidence given before coroners and judges in cases where the explosion of a boiler is one of the items in the cause. The testimony of practical engineers, however, who have no personal interests at stake, and who have given their personal attention to an examination of exploded boilers, generally agrees as to the proximate cause of explosion. This seems to tend to prove the fact that boiler explosions, under ordinary circumstances, may be accounted for, and the subject is one of very great importance. But occasionally there may be cases which puzzle the heads of the most capable engineers.

One of the theories of boiler explosions is, that when the water gets low, leaving fire or heating surface exposed, or covered only with steam—a poor conductor of heat—the iron becomes heated, and will produce a decomposition of the steam, liberating its gases and absorbing the oxygen of the iron. This produces the combination known as oxy-hydrogen gas, highly explosive. It is rarely that enough of oxygen is eliminated, however, to make the mixture dangerous;