HINTS TO THE YOUNG STEAM FITTER.

BY WM. J. BALDWIN.

RADIATION.

Heating surfaces are divided into three classes: 1st, direct radiation; 2d, indirect radiation; and 3d, direct-indirect radiation.

Direct radiating surfaces embrace all heaters placed within a room or building to warm the air, *and are not directly connected with a system of ventilation,*

The best place in a room to put a radiator is where the moist air is cooled—namely, before or under the windows, or on the outside walls. When the heater is a vertical tube radiator, or a short coil, which can occupy only the space of one window, and, as often happens in corner rooms, there are three windows, the riser should be so placed as to bring the line of radiators in front of and under the windows where they will do the most good—say the middle window; or, better still, when a small extra cost is not considered, use two heaters, and place one in front of each extreme window.

When the room is large and has many windows, the heating surface should be divided into as many parts as there are windows; or, if the occupants object to so many windows being partly obstructed, divide into half as many parts and distribute accordingly.

In schools or buildings with many windows, where children or persons cannot change their positions, but have to remain seated for several hours at a time, care must be taken that the heating surface is very evenly distributed. A miter coil run the whole length of the outside wall is best, but if any kind of short heaters are used, every window should have its quota. Should a single window be left unprovided for, it will be found by experiment that a cold current of air will fall down in front of said window and flow along the floor in the direction of the nearest heaters, and cause cold feet to any who are in its passage.

The natural currents in a room, with the outside atmosphere the coldest, are down the windows and outside walls, and up at the center or rear walls. This downward and cold current should be met by the heated and upward current from the radiator, and reversed and broken up as much as possible.

Indirect radiation embraces all heating surfaces placed outside the rooms to be heated, *and can only be used in connection with some system of ventilation.*

There are two distinct modifications of indirect radiation. One where all the heating surface is placed in a chamber, and the warmed air distributed through air ducts and impelled by a fan in the inlet or cold air duct. The other where the heating surface is divided into many parts, and placed near the lower ends of vertical flues leading to the rooms to be heated.

The first of this class—namely, *chamber-heat*—has not proved a great success, and architects and steam heating engineers are likely to have very little more to do with it, as it has been found that in windy weather it is almost impossible to force air to the side of a house or building against which the wind blows. The second of this class has done better, as it admits of taking advantage of the force of the wind to aid in bringing the warmed air into the rooms.

In estimating the heating surface for low pressure indirect radiation it is well to nearly double what would be used for direct radiation; but when the steam pressure is high, and the supply ample to maintain the pressure in the heater, the surface may be reduced directly as to the increase in temperature of steam to be carried.

The indirect heater is usually boxed, either in wood lined with tin or in sheet metal. The former is best when the cellar is to be kept cool, as there is a greater loss by radiation and conduction through metal cases; otherwise metal is best, as it will not crack, and when put together with small bolts, can be removed to make repairs without damage.

The vertical air ducts are usually rectangular tin flues built into the wall when the building is going up; sometimes they are only plastered; but round, smooth metal linings with close joints give much the best results. The cross section of an air duct should be comparatively large, as a large volume of warmed air with a slow velocity gives the best result.

There should be a separate vertical air duct for every outlet or register. In branched vertical air ducts, one is generally a failure.

The heated air from one heater, may be taken to two vertical air ducts, when they start directly over it; but one should not be taken from the top, and the other from the side; if so, the latter will be a total failure, unless the room to which the flue runs is exhausted: *i. e.*, the cold or vitiated air of the room is drawn out by a heated flue or otherwise.

Inlet or cold air ducts are best when there is one for every coil or heater; and its mouth or outer end, should face the some way as the room to be heated. By this means when the wind blows against that side of the house, the pressure is into the cold air duct, and materially assists the rarefied column of air, in the vertical duct, to force its way into the room.

Often the steam heater uses only one large branched cold air duct; but this system will give trouble unless all the rooms are exhausted.

A steam heater should not take a job of indirect heating unless the building has been arranged especially for it with some efficient system of flues, enough for a total change of air in a given time, say not to exceed one hour.

Ordinarily the architect makes no provision for drawing out the cold or depreciated air, other than an open fireplace, and often they make *no* outlet. Such a room cannot be warmed by indirect heating at all. But when there is a chimney, or an unwarmed outlet or foul air flue, the heated column of air in the vertical hot air flue is generally sufficient to force its way through. Very large rooms with high ceilings are difficult to warm by indirect heating.

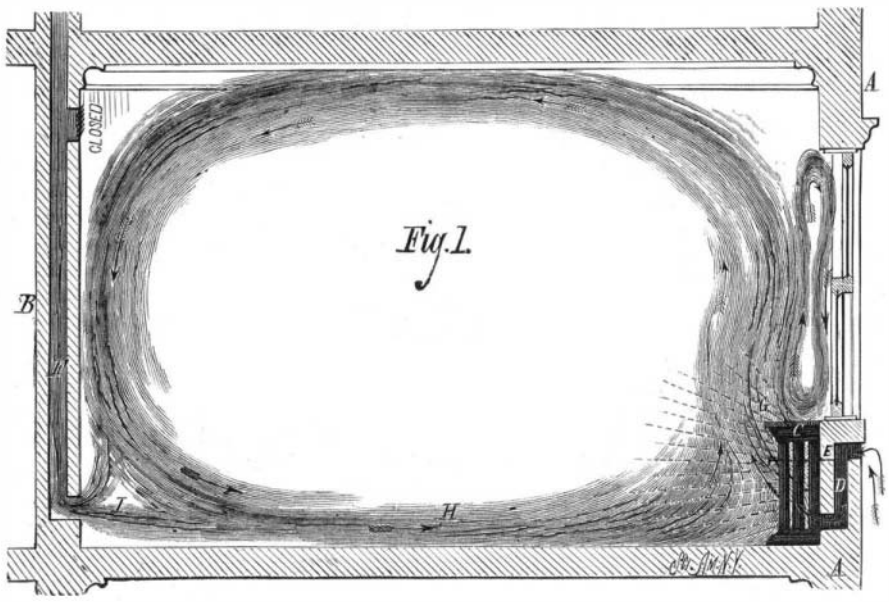


Fig. 1.

DIRECT RADIATION WITH VENTILATION.

A cheap and good way to draw, or exhaust, outlet or foul air flues, is to connect them all to one large annular flue, around the boiler chimney flue.

Warmed fresh air flues, should be in or near the outside walls, and should discharge near the windows; and foul air flues should be in the inner walls, and have an opening near the floor and ceiling, with register valves, to allow the occupant to use either or both as he thinks proper.

To find the time in *minutes*, it will take for a room of known cubical contents, to change its air through a flue of one square foot cross section: Multiply the velocity of the air through the flue in feet per second, by 60, and divide the result, into the cubical contents of the room in feet. Thus: Velocity of air 5 feet × 60 = 300 ÷ into cubical contents, say, 4,000=13·3 minutes.

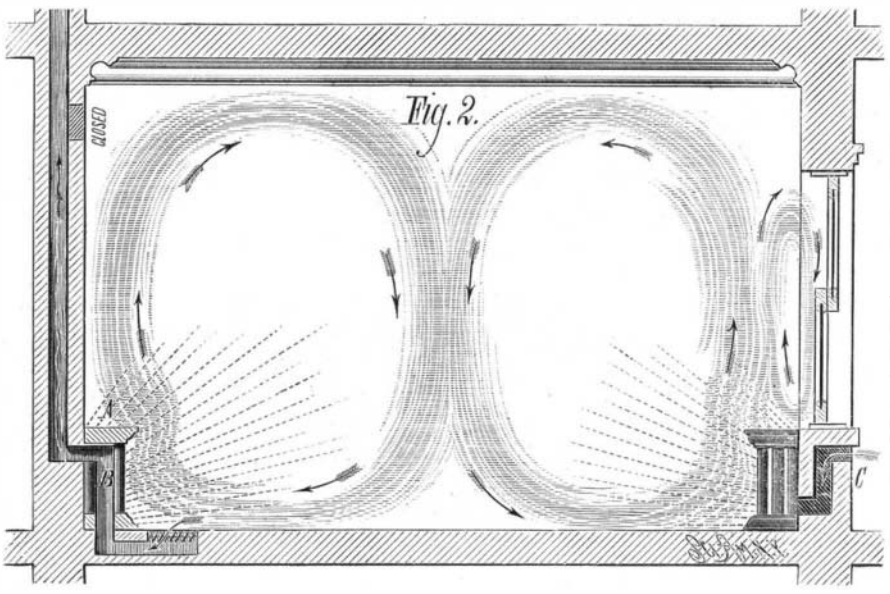


Fig. 2.

MODIFICATION OF DIRECT-INDIRECT RADIATION.

To find the time for other sized flues, multiply the result by the cross section of flues in square feet or fractions thereof.

The velocity of the air in heating flues with only a natural draught, rarely reaches 8 feet per second, no matter what the conditions; and 2 feet, 4·5 feet, and 6·2 feet respectively, being fair averages of velocities for first, second, and third floors of a house.

Direct-indirect radiation embraces all heating surfaces placed within or partly, within the room to be warmed, *in direct connection with some system of ventilation.*

Heaters of this class are usually placed on the outside walls or under windows, following the same general rules as direct radiation, excepting the clusters are deeper, so as to prevent the cold air from rushing through without being warmed.

Fig. 1 shows a much used modification of this style of heating. It is a section of a room showing the action of the currents of air. A A, outside wall; B, partition wall; C, radiator; D, inlet flue; E, damper or valve; F, ventilating flue or foul air outlet; G, fresh air mixing with the air of the room; H, air of the room passing along the floor to the heater; I, a percentage of the air in the room passing off by the ventilator.

Fig. 2 shows another modification of direct-indirect radiation, where some of the *local heat* is employed to exhaust or draw out the vitiated air of the room. The arrows show the action of the air currents. A is a section of a radiator built with a sheet iron flue, B, between the tubes, and passing through a hole, cored in the base, which connects with the register in the floor, and a foul air flue, in the wall.

Some of the radiant heat, etc., from the radiator, A, warms the sheet iron flue, B, which in turn warms the air within it, causing an acceleration of the current in the foul air flue, and consequently drawing an equal amount of fresh air in at the opening, C.

There is this further distinction between the three systems of radiation: Direct radiation warms only the air of the room and maintains the heat. Indirect heating warms only the air that passes in and cannot warm the same air twice, and consequently has to raise the temperature of all the air that passes, from what it is outside, to what is necessary to maintain the temperature of the room, and make up for the loss by ventilation. Direct-indirect radiation warms part of the air over again, and warms all the air there is admitted for ventilation, which latter can be varied to suit the occupants.

NEW INVENTIONS.

Mr. Ole C. Nuubson, of Mount Horeb, Wis., has patented an improved milk cooler, which consists in a milk cooler with trough, gauges, and faucets, and divided into separate chambers by a diaphragm whose central tube extends through the cover.

Mr. Chas. V. Richards, of Skowhegan, Me., has invented an improved clasp, which consists in a case having its edges so arranged as to form jaws, between which a flanged finger piece is pivoted. A wire loop or tongue is adapted to pass through a slot in the case, and has its ends passed through the flanges of the finger piece.

An improved buckle shield, patented by Mr. David Mosman, of New Britain, Conn., consists of a metal plate with curved ends provided with transverse slots and arranged over the buckle, the object being to ornament the harness and to prevent the horse's tail and mane from catching in the buckle.

An improved lubricator, patented by Mr. Oscar A. Rollins, of Campello, Mass., relates to the class of oil pumps designed for supplying oil for lubricating purposes to steam engine cylinders. It consists of an oil forcing piston driven with a intermittent motion by connection with some of the moving parts of the engine.

Mr. John F. Curtice, of Fort Wayne, Ind., has patented an improved device for heating sad irons upon the top of a stove. The invention consists in an improved sad iron heater formed of an open bottomed box divided into compartments by vertical partitions, having the middle part of its top stationary and provided with a handle, and the side parts of its top inclined and formed of doors shutting air tight, or nearly so, and provided with spring catches, to adapt the device for use in heating sad irons upon the top of an ordinary stove.

Mr. Henry S. Kratz, of Chicago, Ill., has patented an improved shelf for attachment to stovepipes for the purpose of supporting culinary vessels, dishes, clothes, or other things requiring to be kept warm or dried.

An improved road-scraper, patented by Mr. Samuel H. Dudley, of Bantam Falls, Conn., consists in the combination of guard bars having their upper ends bent forward at right angles to fit into the notches in the upper edge of the plank, and having sockets formed in their lower parts to receive the rear ends of the draw rods, with the plank, the draw rods and the staples of a scraper.

Mr. Charles A. Gale, of Piqua, Ohio, has patented an improved apparatus for taking solar prints from negatives. The invention consists in the combination of the two frames, hinged to each other at one edge, and provided at the other edge with a bolt and hand nut or equivalent clamp.

Mr. Antoine B. Dembrun, of New Orleans, La., has invented an improved furnace for cooking and baking, and various other uses. It consists in the combination of a furnace, an iron basket, and a hinged grate to form a compact, convenient, and portable furnace.

Messrs. Cornelius Bennett and Parker Burnham, of Silver City, Territory of New Mexico, have patented an improved apparatus for separating gold and other metals from dirt and sediment by what is known as the "dry" process. The invention consists in a combination of devices which cannot be explained without engravings.

Cost and Results of Some Recent English Strikes.

A writer in *Fraser's Magazine* estimates that the engineers' strike, which began in February last and continued about 33 weeks, caused a loss of $70,000 to the strikers. The average number of men out of employment during this time was 500. If no strike had taken place, their wages would have amounted to $144,000. But they received from society funds about $74,000, reducing their personal loss to $70,000. Of notable strikes that have taken place within the last two years, that of the London masons, which lasted 33 weeks and threw 1,700 men out of employment, cost the strikers about $130,000. The carpenters' strike in Manchester involved about the same number of men, and cost nearly as much. The strike and lockout of the boiler makers and iron shipbuilders on the Clyde cost the society upward of $65,000, the estimated losses being $1,500,000. The losses of the miners in the Durham strike are estimated at $1,200,000. In the above strikes, excepting that of the engineers first mentioned, the strikers suffered disastrous defeats. While strikes are exceedingly expensive luxuries to the men, even when successful, the writer above cited maintains that the number of strikes from which the employes reap no advantage are extremely few, as compared with those from which they derive some benefit, proximate or remote. In illustration of what is sometimes gained by the strikers, he cites the builders' strike and lockout in London in 1859. About 24,000 men quit work, but many of these obtained employment elsewhere. The number engaged in the struggle was from 6,000 to 10,000. The whole number interested in the result of the contest was between 40,000 and 50,000. After spending upward of $250,000, besides the loss in wages, the men were compelled to yield. But they gained the Saturday half holiday, which is now enjoyed by not fewer than 100,000 building operatives. This is computed to be a gain to the men of about $2,800,000 a year, "if not in money, at least in money's worth." The writer claims that the employes get over their losses much more speedily than the employers. With the former, he says, it is a matter of temporary inconvenience, or, at most, of present suffering only; with the latter it means not merely a derangement of business for the time being, but in many cases future embarrassment, if not failure.

The First American Rolling Mill.

Mr. Thomas C. Lewis, of Portsmouth, Ohio, who was formerly an iron roll maker, in a recent letter to the editor of the SCIENTIFIC AMERICAN, states that his father, the late Thomas C. Lewis, was the maker of the first iron rolling machine erected in this country. This mill was put up at Middletown, Pa., 45 miles east of Pittsburg, in the year 1817, for the owners, Mason & Co. Mr. Lewis, Sr., came from Wales in 1815, when our informant was thirteen years of age. Our correspondent thinks that himself and his brother are the only persons now living who witnessed the making of the first bar of American rolled iron. This was the inauguration of what is now one of our most important branches of industry.

NOVEL PEDO-MOTOR.

The annexed engraving represents a new device for accelerating the motion of walking. It seems to occupy an intermediate position between the roller skate and the velocipede.

The invention consists of a frame supported on three wheels, two of which are small and employed only in supporting the main frame of the device, while the third and larger one is used both as a supporter of the frame and a driver of the machine. All of the wheels are furnished with rubber tires, and the larger one is fixed to a shaft extending across the frame and carrying a ratchet, also a loose pinion provided with a pawl capable of engaging the ratchet. A foot pedal is pivoted to the upper part of the pedo-motor frame, and carries a segment rack which engages the loose pinion on the drive wheel shaft. When the toe of the foot pedal is depressed the segment rack, by its engagement with the pinion, turns the drive wheel and propels the machine forward. The motion of the foot necessary to impart a rotary motion to the drive wheel is exactly the same as that of the ordinary act of walking. For checking the motion of the pedo-motor a brake is provided, which is made to press upon one of the smaller wheels by pulling a wire or cord, which extends upward, and is provided with a hook or loop for attachment to some part of the clothing of the user. The pedo-motor is the invention of Mr. Richard Gornall, of Baltimore, Maryland.

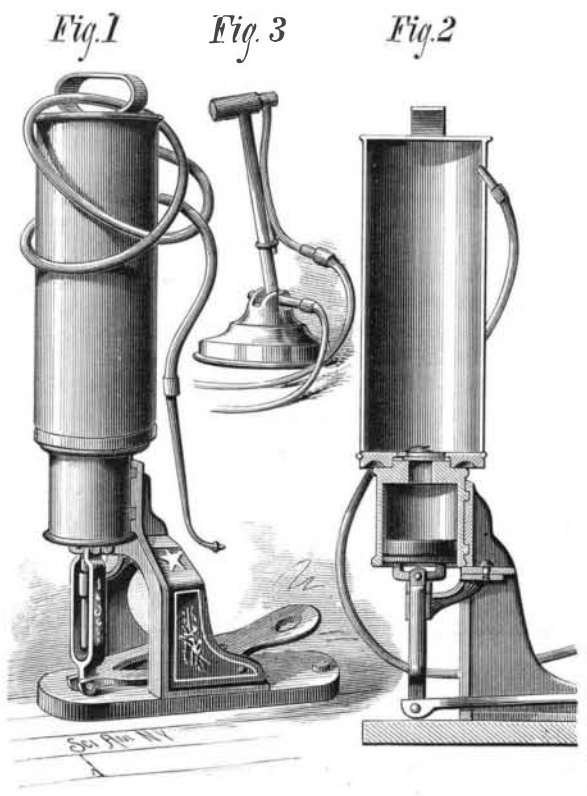
GORNALL'S PEDO-MOTOR.

New Preservative against Scurvy.

In reporting the reception of Prof. Nordenskjöld and the staff of the Vega at Nagasaki, the correspondent of the *North China Herald* notes that there was not a single case of scurvy during the whole voyage. This, he learns, was owing to the free use of a curious little berry that springs out of the eternal ice and snow during the short summer; it bears profusely, and has a taste like the raspberry, but more acid. The fruit is dried, and then mixed with the milk of the reindeer, and it can be carried in a frozen state for thousands of miles. There was also used a curious kind of food made from the whale's hide, which is pickled and eaten freely during the winter.

IMPROVED BLOWPIPE.

The annexed engraving represents a compact, simple, and efficient device for maintaining a continuous supply of air under light or heavy pressure for blowpipe use. The advantages of an invention of this character will be readily admitted by any one having had experience with the ordinary mouth blowpipe, as it not only saves a great amount of hard labor, but it delivers a steadier and stronger blast than it is possible to maintain with the mouth, and it also enables the operator to get a better view of his work, and permits of greater freedom in the use of the hands.



BURGESS' PATENT PORTABLE MECHANICAL BLOWPIPE.

The general appearance of the blowpipe is shown in Fig. 1, and its internal construction will be readily understood by referring to Fig. 2, which is a central vertical section. The pump cylinder is mounted on an arched standard, and contains a piston having a valve opening upward. This piston is connected with the foot pedal by a forked connecting rod, and is moved by a slight and easy motion of the foot. The upper end of the pump cylinder is closed, with the exception of a valve aperture, which is covered by a valve, opening upward into a cylindrical air reservoir secured to the upper end of the pump. Near the top of the air reservoir there is a nipple, to which is attached a flexible tube communicating with the blowpipe.

The manufacturers furnish either the ordinary blowpipe or the compound blowpipe, represented by Fig. 3. The machine is light and portable, weighing but twelve pounds and measuring twenty-four inches in height. The pump cylinder is two and a half inches in diameter with three inch stroke.

This device will be invaluable to a large class of artisans, and especially useful to dentists, jewelers, chemists, assayers, metal workers, miners, and others who desire a strong steady blast for reducing, fusing, soldering, etc. It may be used to advantage in connection with the small melting furnaces now so largely in use. It is also of great utility to machinists and steam, water, and gaspipe fitters in making alterations and repairs, as it admits of the local application of a strong heat, and thus obviates the necessity of removing the parts. The blowpipe may be used effectively in connection with a gas, alcohol, or oil flame.

The pipe outlet is much smaller than in the mouth blowpipe, to permit of maintaining a pressure which may be increased or diminished by a quick or slow motion of the treadle. The air chamber is easily filled, and when charged affords a *constant* supply of pure air. It is claimed by the manufacturers of this blowpipe that the pump possesses many advantages over the bellows or bladder, as a pressure of many pounds is readily sustained with but little exertion.

Further particulars may be obtained from J. Elliott Shaw, No. 154 South Fourth street, Philadelphia, Pa.

MECHANICAL INVENTIONS.

Mr. George Stewart, of High Point, N. C., has patented an improved spark arrester. This is an improvement in the class of smoke stacks in which the ascending sparks and cinders are diverted laterally by an inverted cone and strike upon inclined flanges or wings, whereby they are extinguished and pulverized before escaping from the stack.

An improved drilling machine has been patented by Messrs. Nicholas Remmel and Mathias Remmel, of Kewaskum, Wis., for operating drills for drilling holes in metal, and also for holding auger bits and other tools for boring wood. It consists in a drill stock connected with a shaft rotated by a crank or band wheel and gearing and held in a stationary frame, and in a device for feeding the work to the drill by means of a table placed on a shaft held in vertical guides and connected by levers with a treadle.

Mr. Elias A. Wible, of Folsom, Cal., has patented an improved vehicle axle formed of a socketed tube and a wooden stick, in combination with an interposed layer of rubber. There is a hole leading through the axle to the shaft, and provided with a case, a cup, and a screw, for the purpose of lubrication.

Mr. Gustave Wedel, of San Francisco, Cal., has patented an improvement in the class of binders for folios, or a series of detached leaves; it consists of metal strips doubled longitudinally to form lips or clamping edges, between which the leaves are secured.

Mr. John Kenmuir, of St. Joseph, Mo., has invented an improved twelve bells striker for clocks, the object of which is to furnish a clock for use in Masonic lodges, which shall be so constructed that it may be made to strike twelve low bells whenever desired, which will strike at no other time.

Mr. William W. Mackey, of Galion, O., has patented an adjustable gauge for cutting bevels for miter joints with a circular saw, and for cutting them on opposite ends of the moulding without changing the gauge. It consists of two gauges pivoted at one end to the sliding bed on the side next to the saw, and having the opposite ends pivoted to levers or arms having longitudinal slots, which are crossed and secured together and to the bed by a set screw passed through the slots at the junction. These arms are designed to be graduated so as to permit the gauges to be set readily at any desired angle to the saw.

Mr. Richard Cotter, of Virginia City, Nev., has patented a machine for tarring flat and round wire ropes, which is so constructed as to coat the ropes thoroughly with tar, force the tar into the crevices of the ropes, remove the surplus tar, and prevent it from running down the ropes.

Mr. Warren H. Guthrie, of Florence, N. J., has patented an improved screwdriver having a jaw on each side of the blade, the two jaws being connected by a right and left thumbscrew passed through a slot in the blade, whereby the ends of the jaws can be moved to and from the blade, and thus adapted to clasp screw heads of various sizes.

Messrs. William F. Flanagin and Daniel A. Sager, of Pine Wood, Tenn., have patented an improved automatic let-off mechanism for looms, for letting off the yarn from the yarn beam at a uniform speed from the first to the last end of the warp, the speed of the yarn beam being increased in proportion to the decrease of the yarn on the beam.

Mr. Ansel T. Green, of Minneapolis, Minn., has patented an improved belt stretcher. It consists in fixing gear wheels on the heads of the two long side screws of the stretcher, and in arranging two corresponding pinions on a crank rod in such a manner that when the pinions are thrown in gear with the gearwheels both screws will be worked simultaneously; and it further consists of a graduated clamp for the more accurate adjustment of the sides of the belt, of hinged screw sockets for the quicker attachment and removal of the stretcher, and of a thumbscrew nut of novel construction.

Messrs. Jabez C. Terry and Herbert J. Terry, of Springfield, Mass., have patented an improved button lathe designed for turning buttons into finished shape from blanks previously prepared; and instead of operating upon the principle of a cutter formed to suit the pattern of button, it employs a single cutting tool, which, by a variety of adjustments, that may be effected either by hand or automatically, permits the button to be turned and finished according to any desired pattern.

The same inventors have also patented an arrangement of revolving gripes for holding the stock, which are held normally together by spring pressure, but have a treadle connection for separating or retracting them, and a cutter head revolving in a plane at right angles to the plane of revolution of the gripes, or parallel with the axis of the latter, which cutter head is combined also with a treadle connection for causing the cutter head to approach the axis of the gripes at the will of the operator.