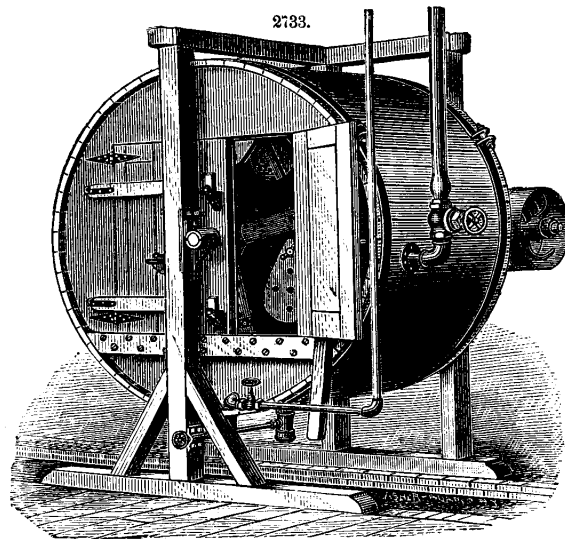


LAUNDRY MACHINERY. The process of laundering as now practised in this country differs materially from the methods formerly employed; boiling of the fabrics, hand-rubbing, and friction-ironing having been entirely superseded by various ingeniously contrived machines. The process is divided into four departments—bleaching, washing, starching, and ironing.

BLEACHING.—The bleaching process is required more particularly for new work. Its object is to whiten the goods, and also to remove any traces of oil which may have adhered to the fabric during the process of manufacture. This is accomplished by soaking



the articles for a variable length of time in a solution composed chiefly of chloride of lime and caustic soda, thoroughly incorporated with a large quantity of water. After having remained in the lye solution for a sufficient period, the articles are dipped in the "sour," which is a solution made from oil of vitriol and water. This solution neutralizes and removes all trace of the alkali. Both of the bleaching solutions are made quite weak, so as not to injure the fabric submitted to their action.

WASHING.—*Power-washing Machines.*—There are three principal types of washing machines, the employment of each being determined by the class of goods to be washed. In collar and cuff laundries the *dash-wheel*, Fig. 2733, is considered the most efficient. It consists of a stationary cylindrical case, having in its interior a wheel divided into four compartments and hung upon a horizontal shaft. The wheel is either made water-tight or perforated. The former construction is preferred

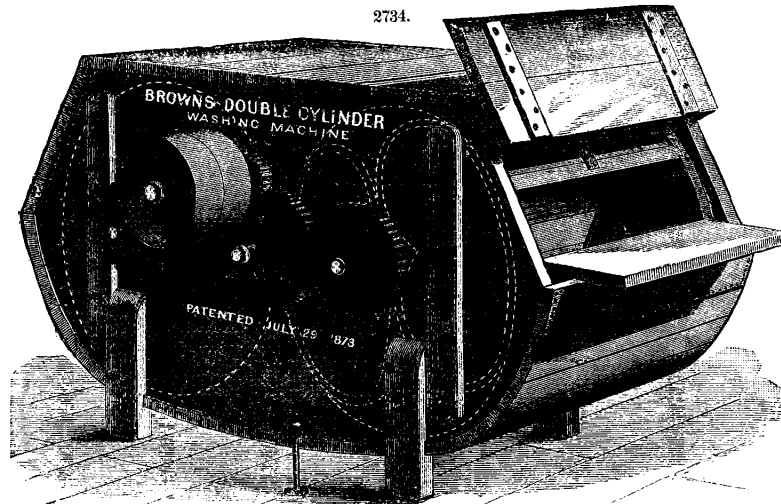
when small articles, and the latter when large goods, are to be washed.

The wheel is generally one foot smaller in diameter than the inclosing cylinder. For small work it measures usually 6 ft. 6 in. in diameter and 2 ft. 6 in. in depth; for large articles the diameter of the wheel is from 7 to 8 ft. Motion is imparted to the wheel by bevel-gearing. The speed of the wheel is from 20 to 22 revolutions a minute. Water is admitted into the stationary cylinder in a quantity sufficient to rise about 2 in. above the bottom of the wheel. When ready for washing, the goods are put into the different compartments of the wheel with a weighed amount of soap, the doors are closed, and the wheel is set in motion. By the revolution of the wheel the goods, constantly falling, are subjected to sudden impacts with the water, by which means the dirt is loosened and removed. The water is heated and kept almost at the boiling point by the admission of live steam. The time required in laundering new work with this machine is about four hours, but a somewhat longer period is usually given for the larger articles of wearing apparel.

In the *Brown washer*, Fig. 2734, the method of washing is similar to that of the dash-wheel, in that the goods are subjected to continuous falls. This machine, however, accomplishes its work by violently agitating the articles within its cylinders. The dotted lines in Fig. 2734 show the way the cylinders are divided. It will be readily understood that the rapid revolution of the cylinders subjects the goods to a number of short falls, thus loosening the dirt as in the case of the dash-wheel; but it requires a somewhat longer time. The cylinders have short shafts bolted to their sides and

geared to the driving-shaft. The capacity of the machine is about 700 dozen of collars and cuffs at a washing. The cylinders are 40 in. in diameter, and make from 60 to 65 revolutions a minute.

In Fig. 2735 is shown the *Nonpareil machine*, which is entirely different in principle from the machines above described. Four vibrating arms, depending from a horizontal cross-piece, are connected

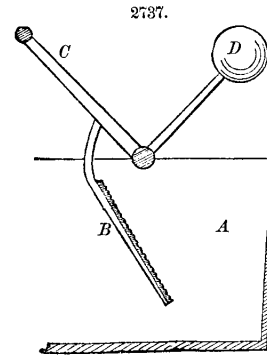
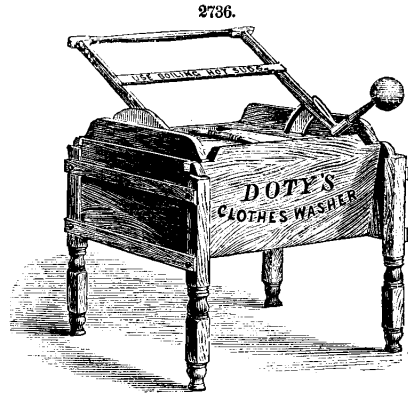


by cranks to the driving-shaft. These cranks are placed at different angles on the shaft, so as to give the arms a uniform motion by pairs. On the ends of the arms are the rubbing-boards. The machine is run at a speed which gives 440 strokes of the arms per minute. This rapid motion, combined with the positive action of the beaters, squeezes the goods between the inclined corrugated faces of the rubbing-boards and the body of the machine. The arrangement of cranks is such that while one pair of boards are squeezing the goods the other pair have receded, and the fabric is opening and reabsorbing the water. By the rubbing-boards the goods are rolled over and over until they are thoroughly washed. This machine is much used in hotels and large manufactories.

2735.

Hand-washing Machines.—The principle of rolling over or kneading the clothes has been applied successfully in the construction of hand-washing machines, better results having been obtained from apparatus thus constructed than from machines in which the fabric is compressed between rollers, the tendency of which is to cause wear of the articles and to crush buttons. The *Doty washing machine*, represented in Fig. 2736, consists of a water-tight case with a raised edge in which are placed the bearings on the handle. The wash-board is attached to the depending arm of the lever in such a way that the latter is easily moved. The clothes are placed in the case, and by moving the lever up and down as in pumping they are thoroughly rubbed, squeezed, and lifted at each stroke. The action of the lever is aided by a compensating ball, as shown in Fig. 2737, in which *A* is the case, *B* the wash-board, *C* the lever-handle, and *D* the compensating ball.

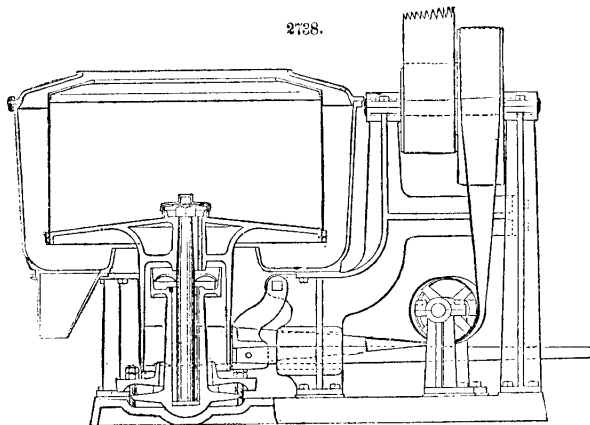
To wash any fabric properly, it is of the utmost importance that the water be pure. Many extensive laundries have found it necessary to build large charcoal and gravel filters in order to render the water fit for use. Water that is very hard, containing large quantities of lime, will not properly



wash the goods, besides being injurious to the fabric. With regard to the soaps used, it may be noted that many which serve excellently for the household laundry are not suited for employment in connection with the machines. Those which have been found best adapted for extensive laundry work are manufactured from pure tallow and an alkali—in one case, caustic soda. Many of the soaps offered for laundry purposes are so loaded with rosin and the silicates as both to injure them and to render them unnecessarily expensive.

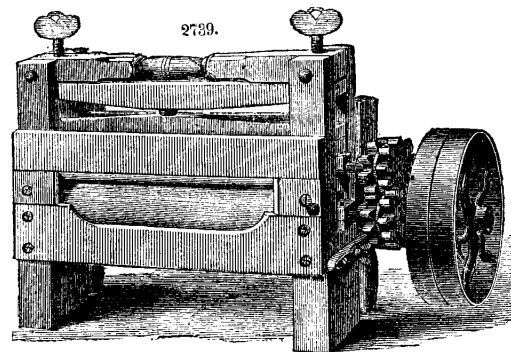
Wringing Machines.—After having been thoroughly washed, it is necessary that as much water as possible be extracted from the goods. The more perfectly this is accomplished, the better they will take the starch. Wringing is effected either by the hydro-extractor or by means of a power-wringing machine.

Fig. 2738 represents the *Tolhurst extractor*, which consists of a perforated copper basket inclosed in a cylindrical case.

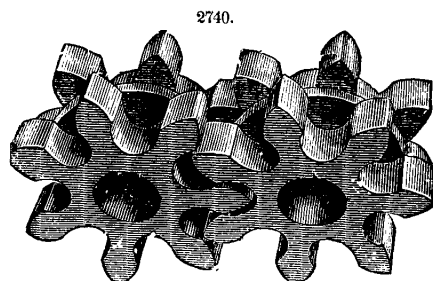


Motion is imparted to the basket at the rate of 1,000 revolutions a minute by means of a perpendicular shaft driven by a corner-turned belt over two loose pulleys. The base of the shaft is expanded, and underneath it are placed three rubber balls, the object of which is to prevent tipping or wobbling as the revolutions of the basket are reduced and the basket is brought to rest. This machine will remove the water from almost any article, but is specially adapted for use in collar and cuff laundries.

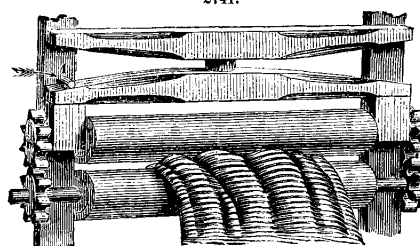
The *Universal wringer*, Fig. 2739, consists of two parallel rolls of vulcanized rubber fitted to shafts having at one end a double set of gears, which are arranged with long and strong alternate double sets of cogs on the same wheel. The arrangement of the cogs is shown in Fig. 2740, and is such that they cannot work laterally out of their places or bind. The rims between the teeth being of equal size, they roll easily when pressed together. The uppermost roller is set in loose boxes, upon which pressure is applied by means of a wooden spring, as shown in Fig. 2741. In attaching the rubber rolls to the iron shafts, considerable difficulty has been experienced from the fact that the sulphur of the rubber unites with the iron, rendering the metal porous.



The rubber is also rapidly softened and destroyed. To obviate this difficulty, the shaft is first varnished, then wound with linen thread, after which several more coats of varnish are applied, and



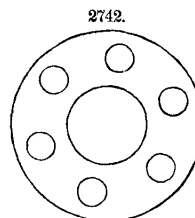
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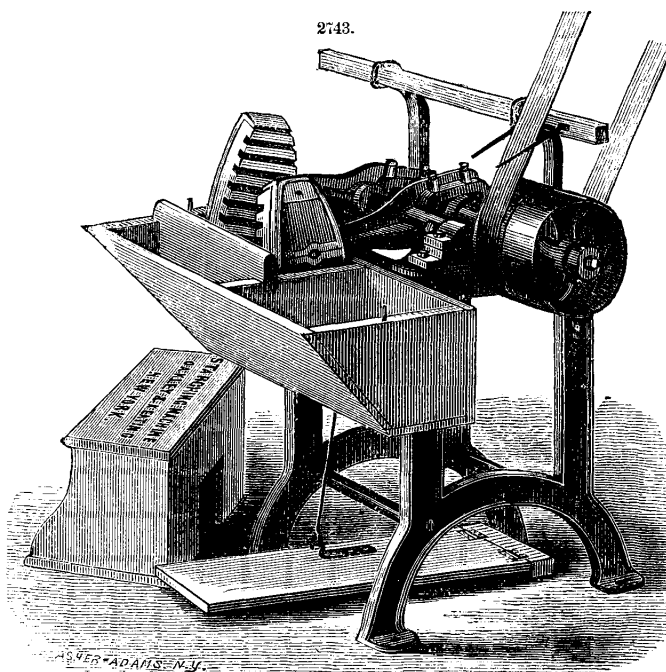
2741.

finally the whole is covered with rubber cement. In the large sizes of the Novelty wringer, where great strain comes upon the rolls, they are perforated with holes for six lateral shafts, which fit into caps on each end of the main shaft. Fig. 2742 is a section of the roll. By this means any loosening of the rolls on the shaft is effectually prevented.

STARCHING.—*The Dipping Wheel.*—From the wringer the goods are taken to the dipping wheel. This consists of a cylindrical case hung upon a horizontal axis. The goods are put into this wheel with a certain amount of dipping starch, which is made by boiling wheat or corn starch and water together for 15 minutes, and adding an exact amount of aniline or ultramarine blue, the latter being preferred for shirts. The method of preparing the bluing differs in various laundries. It is rather an odd fact that goods are blued to suit the whims of various consumers in different sections of the country. Thus new collars, cuffs, etc., for a southern market are made of a tinge different from those intended for a western market, the hues running through changes of yellow, green, and blue. The names of the chemicals used for this purpose are trade secrets, as each firm have special receipts of their own. The starch used should be of the best possible quality. Corn starch is considered preferable, not only as containing more starch and less water and gum, but also for sanitary reasons. Fermented starch is always liable to a refermentation, and therefore is not only deleterious to health, but also destructive to the fabric to which it is applied. Pure chemical starch gives the best results. The starch chiefly used in the great laundries of Troy, N. Y., is that made by the Glen Cove Starch Company. This, by chemical analysis, gives the following composition: Starch, 85.62; moisture, 14.11; ash, .26; total, 99.99. The material contains no putrescible or poisonous substance, and is exceedingly pure. The goods are left in the dipping wheel for 15 minutes, which time, as the wheel revolves very rapidly, is sufficient thoroughly to incorporate the starch with the fabric. From the wheel the goods are sent to the rubbing or forming room.



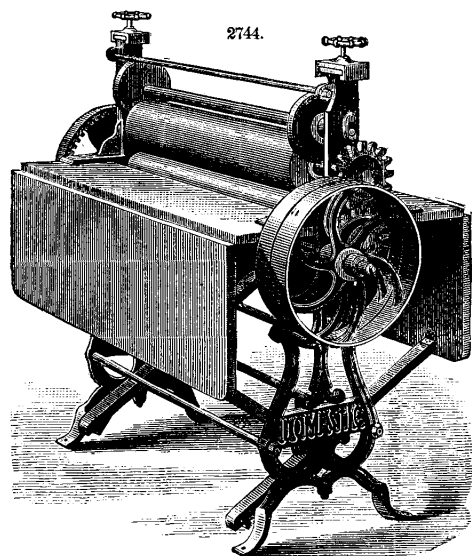
2742.



2743.

The term "forming" is applied to a process in which a second quality of starch is thoroughly rubbed into the texture of the article, the object being to remove all wrinkles and straighten out the material, so to speak, into the proper shape for ironing. The starch used for this process is boiled for one hour, the bluing (generally aniline) being mixed with it. Forming is performed either by machines or by hand.

Starching Machines.—Fig. 2743 represents the Oakley & Keating starcher. It consists of an iron framework supporting a horizontal shaft with double cranks, which actuate with a reciprocating motion two arms having corrugated rubbing faces, working vertically in the starching box, which contains the rubbing starch. The goods being inserted between the arms, the motion of the faces rubs in the starch. The goods have then to be finished by hand, as no machine as yet invented completely accomplishes the object desired. As soon as the goods are formed, they are hung upon frames supported on iron ways, and are taken into a steam-drying room. When dry, they are removed and dampened, either by being sprinkled, or, in the case of collars and cuffs, by being rolled in wet sheets and left for one hour, when they are packed in boxes and sent to the ironing room.



IRONING.—Mangles.—The domestic mangle, Fig. 2744, consists of two parallel rolls of hard wood run by suitable gear. The upper roll is fitted with loose boxes, and the required pressure is regulated by screws. These machines are used for sheets, blankets, and other large articles in which no starch is used.

There are three principal forms of hot mangles. In the mangle of the Troy Laundry Company, the heat is supplied to the rollers by the combustion of gas within the ironing roller. The apparatus consists of an iron framework supporting a revolving ironing roller, 6 inches in diameter, immediately under and in contact with which is a drum covered with felting. The drum and ironing roller revolve at the same rate of speed. A small blower is set in the framework, and is used to supply the air which mixes with the gas. By means of a compound lever much or little pressure can be exerted upon the drum, de-

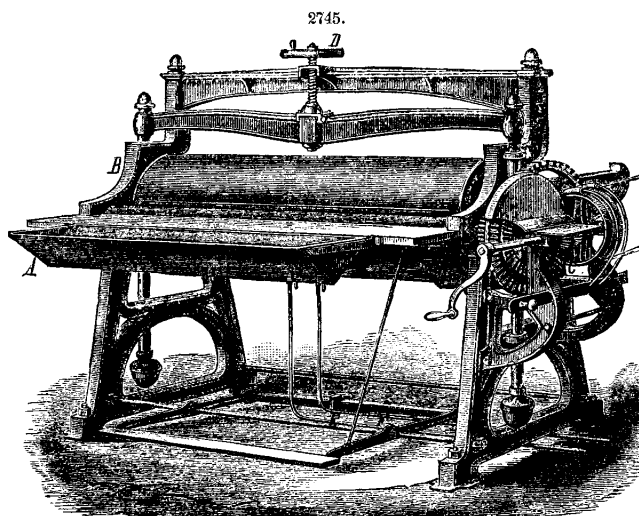
pending upon the quality of the articles passing through the machine. Where polish is desired, the ironing roller is made to revolve faster than the drum, by changing the size of the gear-wheels. The capacity of this machine is 2,000 table-cloths or 10,000 napkins a day.

The French steam mangle, Fig. 2745, is composed of a steam-chest *A* and a revolving cylinder *B*. Steam is admitted at *E*, the exhaust passing off at *F*. *D* is a gauge-screw, which is used to regulate the pressure, the cylinder being fitted with loose boxes. The speed of the cylinder is regulated by the beveled gearing at *C*. This machine does its work by compressing the goods between the cylinder and the steam-chest. The rate of speed is low. The cylinder has two jackets of felting covered with muslin to absorb the moisture.

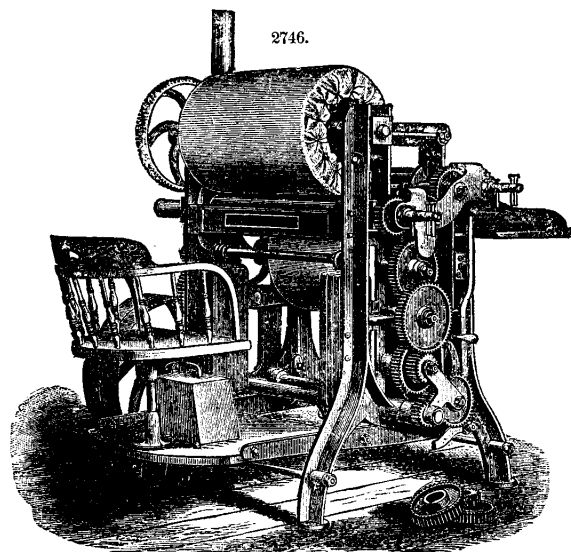
The third style of hot mangle consists either of a roller or stamping iron, in which a bar or block of metal is placed, which has been previously heated to redness. This style is little used, as the heat produced varies to such an extent as to render the ironing very uneven.

Ironing Machines have been constructed under all three of the principles mentioned. Experience has proved, however, that gas is best adapted to the conditions required, and is less expensive.

Fig. 2746 represents the Wiles & Adams ironing machine, which consists of two pairs of revolving drums and ironing rollers, supported in an iron framework and connected with suitable gears. Collars, cuffs, and other articles of cloth, generally have one side which must present a nicely finished ironed surface, while the other side need not be thus finished. In practice the best finished surface is produced by the last ironing roller to which the articles are subjected. In this machine the articles are first introduced by hand and in a damp condition between the first set of rollers, *B C*, Fig. 2747, and are thereby considerably dried, and gen-

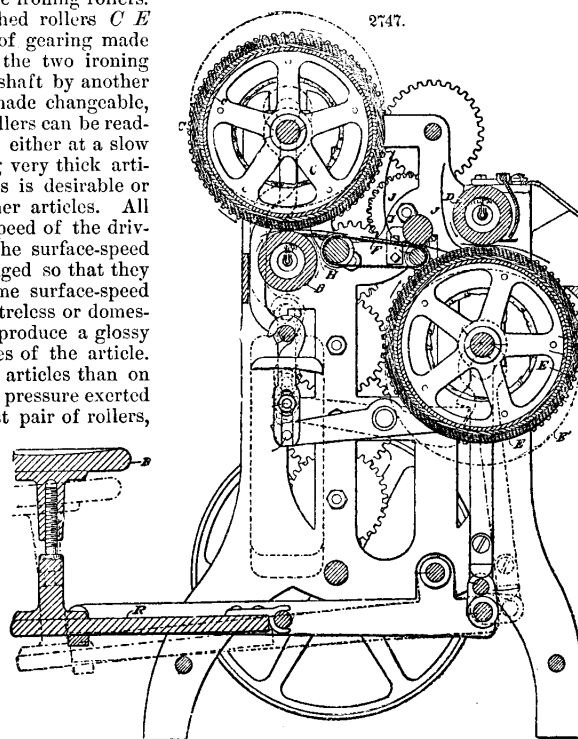


erally ironed sufficiently on one side. They are thence directed by the guide and conducted by the feeding device—which consists of an endless apron made of linen warp with fine cane run through

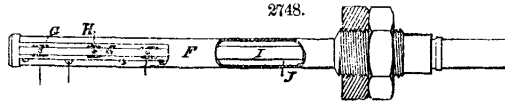


it, revolving from front backward—over two geared rollers, so as to have the same surface-speed as the clothed drums. The fabric passes to the second set of rollers, *D E*, which finish the drying of the articles and iron the other side completely, discharging them upon an apron or table. It is important that the most highly finished surface should be uppermost when leaving the machine, so that the attendant can detect imperfections, and repress the article if necessary between the last set of ironing and clothed rollers only. To secure this result, the machine is so arranged that the first set of rollers with the clothed roller *C* is over the ironing roller *B*, and the second and last set of rollers with the ironing roller *D* over the clothed roller *E*, and an open feeding-in space *J* is provided between the roller *D* and the roller *C*. The two clothed rollers *C* and *E* are connected together and to the driving-shaft by a set of gearing, so as to be positively turned with substantially equal surface-speed by that shaft; and the two ironing rollers *B* and *D* are geared with the same driving-shaft by another and separate train of wheels, which communicate substantially equal surface-speed to the ironing rollers. The surface-speed of the clothed rollers is about 3.6 per cent. faster than that of the ironing rollers. By thus connecting the two clothed rollers *C E* with the driving-shaft by one set of gearing made changeable, and also connecting the two ironing rollers *B D* with the same driving-shaft by another and separate set of gearing also made changeable, the surface-speed of the clothed rollers can be readily altered, so that they are turned either at a slow rate of speed suitable for ironing very thick articles, or at different faster rates as is desirable or necessary in ironing various thinner articles. All this is done without altering the speed of the driving-shaft; and at the same time the surface-speed of the ironing rollers can be changed so that they will be turned either with the same surface-speed as the clothed rollers to give a lustreless or domestic finish, or to a faster speed to produce a glossy ironed surface on one or both sides of the article. Higher finish on one side of the articles than on the other is effected by the greater pressure exerted during the passage through the last pair of rollers, by means of compound levers. The strain exerted on the first pair is about 200 lbs., and on the last pair 2,000 lbs. Upon the lever is the seat *R*. The weight of the person feeding the articles causes or assists in pressing the clothed roller *E* against the ironing roller *D*, with a yielding force that is necessary in ironing the articles. Hence, when the person stops feeding and gets off the platform, the pressure is removed and the rollers are separated.

The ironing rollers *B D* are constructed of cast iron and made hollow, and are heated internally by a mixture of gas and air. The principle of the burner, Fig. 2748, is that of the Bunsen burner slightly modified. Fig. 2749 is a section of the burner, which is placed within the ironing roller and is stationary. At one end of the roller is situated a pipe, which



conveys to the chimney the products of combustion. The burner itself consists of a cylindrical tube *F*, Fig. 2748, which contains the tube *I*. The gas and air admixture (gas one part, air ten parts) is brought to the tube *I* by rubber tubing having gauge-cocks to provide for regulating the amount of admixture. At *G G* are orifices in the tube *I*, where ignition takes place. With the ordinary burner it is found that in tubes of a small diameter combustion of the gaseous compound is not entire, owing to a deficient supply of oxygen. The consequence is, that

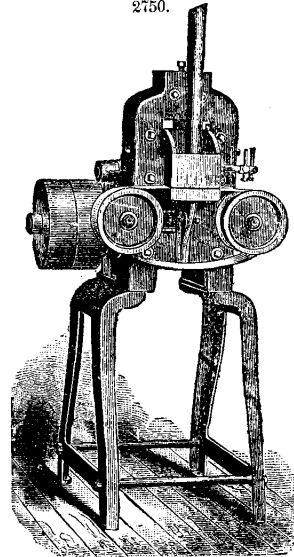


the inside of the ironing roller soon becomes covered with soot, which not only prevents the heating of the roller, but also sifts out over the goods during their passage through the machine. To obviate this difficulty, a current of pure air is forced by means of a small blower through the inside of the tube *F*, in the space *J*, outlets *H H* being provided immediately in apposition to the gas outlets *G*. By this arrangement good combustion is secured, and the perfect heating of the ironing rollers is the result.

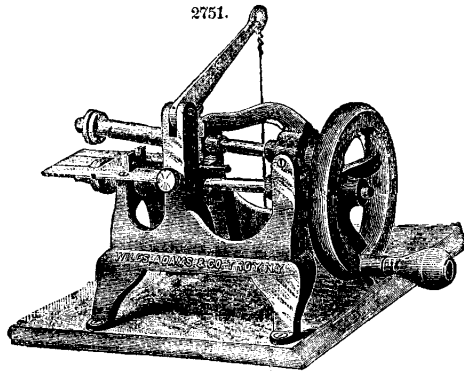


In ironing machines made with an ironing roller turning against a clothed roller, the water or moisture that is driven out hot from damp articles is absorbed by the fibrous covering, so that the latter becomes quite wet. To prevent oxidizing the metal of which the drum is made, a layer of three-sixteenths of an inch of vulcanized rubber is first laid over the metal. In order to lessen the heating of the rubber, the body of the roller is made in the form of a thin metallic shell more or less open at the ends. The rubber is surrounded by three jackets of felting, in all one-fourth of an inch in thickness. Over this are wound 5 yards of canton flannel and 10 yards of muslin; the whole is secured by recesses in the cylinder and tightly fitting clamping-

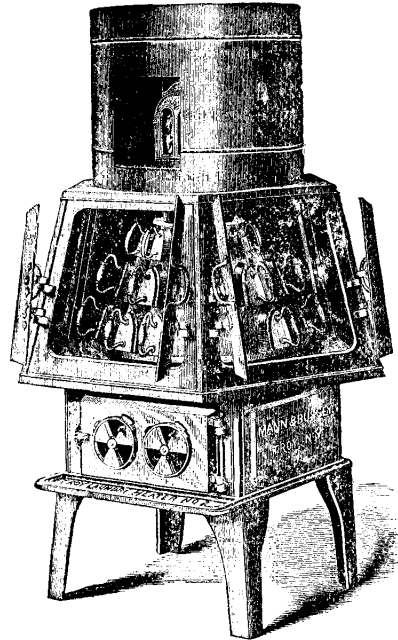
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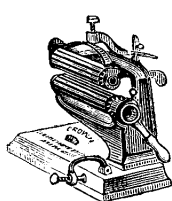
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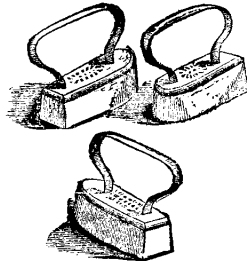
2754.



2752.



2753.



rings. The speed of the rollers in ordinary work is about 6 revolutions a minute, and their capacity is 1,000 dozen of collars and cuffs a day.

Fig. 2750 represents a collar-finishing machine. Many of the collars worn at the present day have points which are turned down; and as the process of turning down brings that side of the collar into view which has the less highly finished surface, it is necessary to re-iron the under side of the points.

The machine used consists of a plunger-iron heated by the gas-burner, as described in the Wiles machine. Under the plunger and over the bed passes a belt of felting to absorb the moisture, and the plunger is lifted and brought down by pitmans fastened to the crank-pin. The belting is rotated by a beveled gearing moving the length of the bed at each lift of the plunger.

The edge is raised on collars and cuffs by means of the machine shown in Fig. 2751, consisting of two cold narrow steel rolls, between which the article is passed.

Fluting is accomplished either by pressing the articles between a fluted sadiron and similarly fluted base-plate, or by passing the material between fluted parallel rollers, as shown in Fig. 2752.

The irons used for pressing the edges of turn-down collars are made in the shape shown in Fig. 2753. Where a polish is desired, Japanese wax is lightly rubbed on the surface of the articles.

Fig. 2754 is the laundry heater, used for warming irons for hand-finishing. The fire-pot or body of the stove has concentric rings around the outside, on which the irons rest. The fire-pot is in the shape of an inverted funnel, and is kept filled to the top of the upper door. The irons are kept immediately in contact with the portion in which the greatest amount of heat is generated. In summer the outside doors can be closed, allowing the heat which would otherwise be sent out into the room to pass up the chimney. As a strong fire is required, the ash-pit and under air-space are made large.

G. H. B.