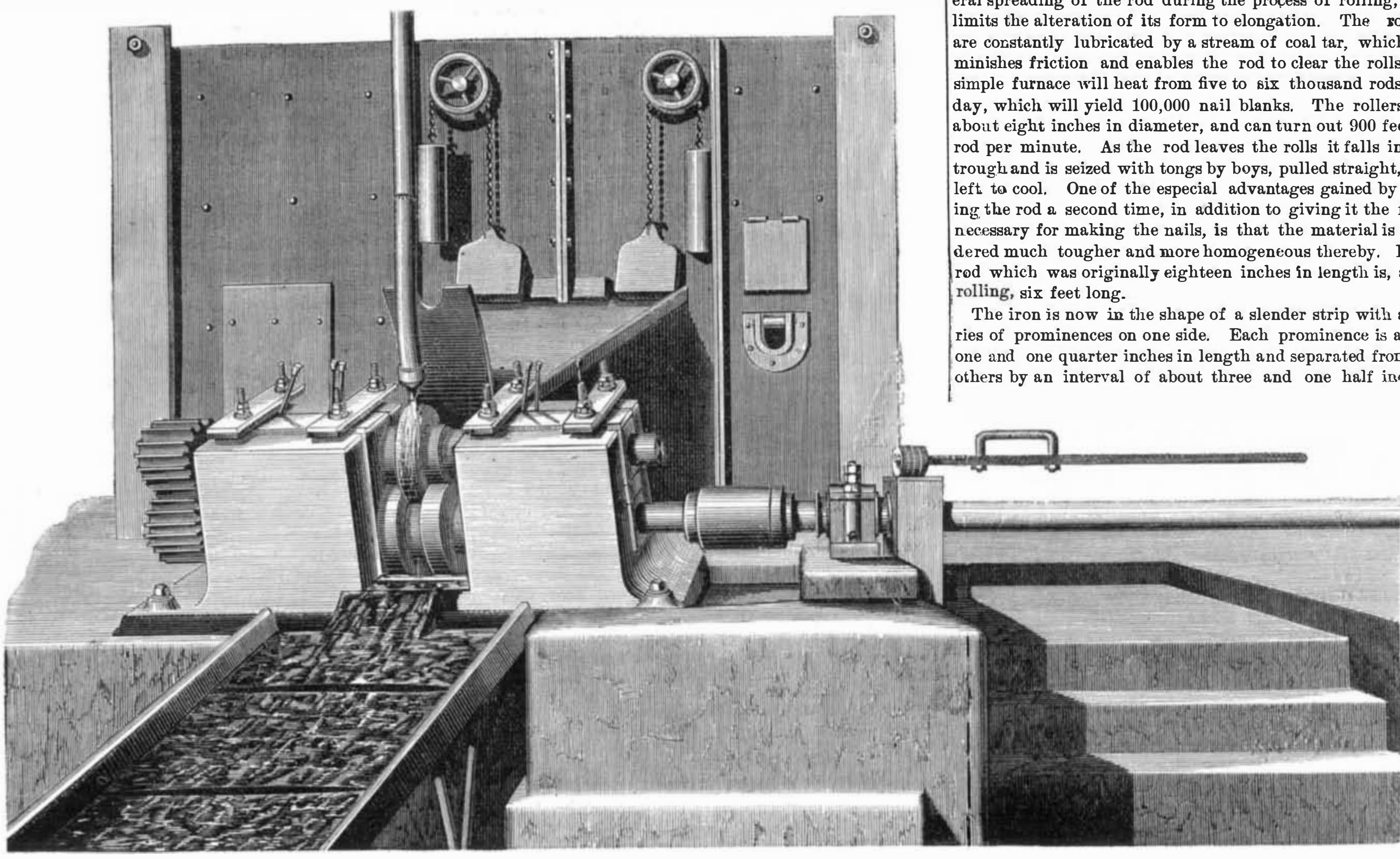
HORSESHOE NAIL MACHINERY.

A horseshoe nail must be made from a peculiar description of iron. It must be tough and flexible, and yet capable of penetrating the hardest hoof without bending. The head must be well secured to the shank, and not liable to be severed from it by the shocks incidental to the rough wear and tear it receives. In fine, it would seem that its necessary qualities are so numerous that mere machinery would be inadequate to accomplish its manufacture except in the matter of shape. Nevertheless machines have been invented and placed in operation in England which answer every requirement, and a single factory at the present time is able to produce five tuns of finished horseshoe nails per week.

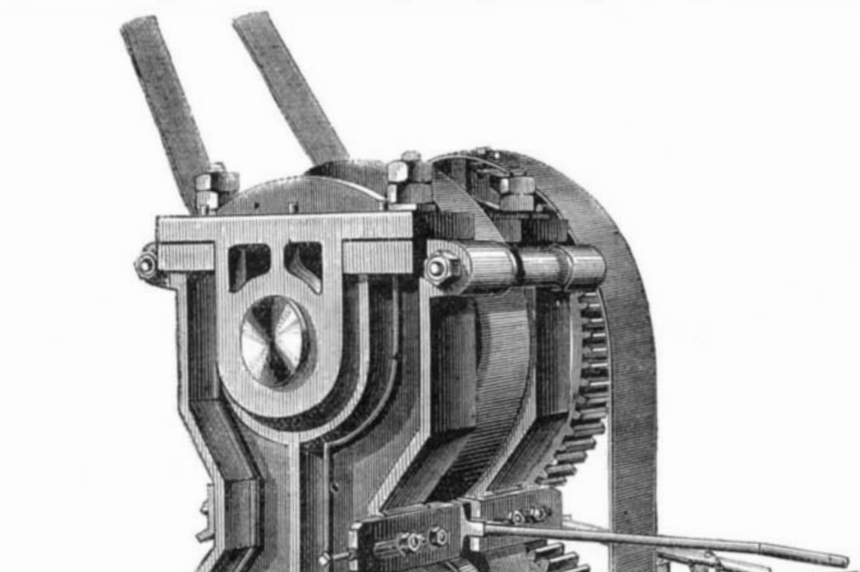
Of these very ingenious devices, we present herewith illustrations, for which we are indebted to the *Practical Magazine.* They are six in number, and represent the rolling mill, and flattening, cutting, rumbling, heading, and shaping machines, which are all inventions of the Messrs. Huggett, father and son.



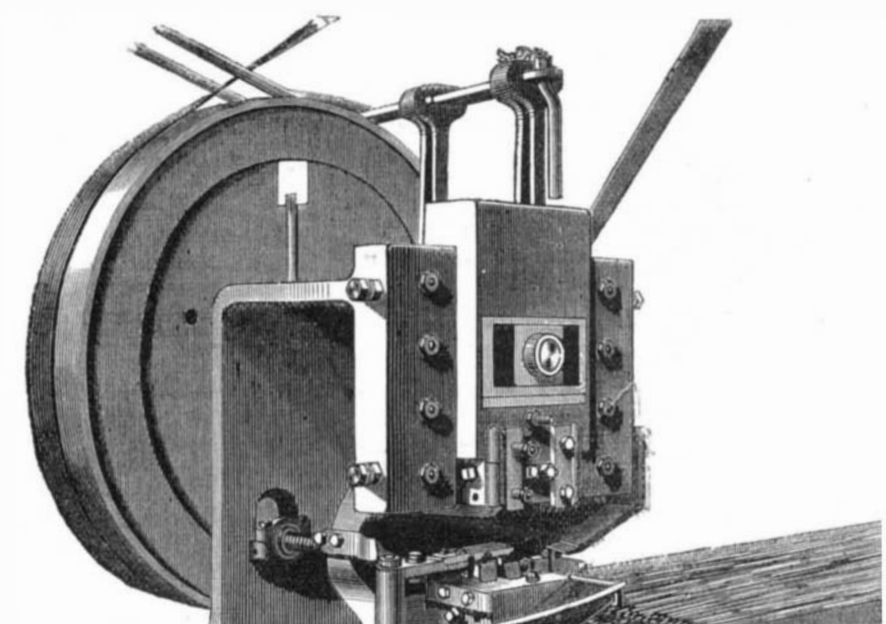
THE ROLLING MILL.

The rolling mill, in which the iron is first manipulated, has for its upper roller a simple cylinder; the lower roller has a series of depressions or small nicks on its circumference, separated by intervals. Each depression corresponds to two nail heads, each interval to two shanks: and the surface of the roller is curved in the intervals so as to place the most prominent part in the center. The iron is in the form of rods, each eighteen inches long, by half an inch wide and one eighth inch in thickness. These are heated in a Siemens furnace, which is provided with two openings, at each of which a workman is stationed. The cold rods go in at one door and hot ones come out at the other, and as fast as one opening is supplied the other is exhausted. As the rods emerge they are drawn out upon a chute down which they run to the rollers, which revolve at the rate of 500 revolutions a minute. The rolling surface is very narrow, corresponding to the thickness of the rod, and a strong ring is fixed on the rolling shaft which prevents the smallest lateral spreading of the rod during the process of rolling, and limits the alteration of its form to elongation. The rollers are constantly lubricated by a stream of coal tar, which diminishes friction and enables the rod to clear the rolls. A simple furnace will heat from five to six thousand rods per day, which will yield 100,000 nail blanks. The rollers are about eight inches in diameter, and can turn out 900 feet of rod per minute. As the rod leaves the rolls it falls into a trough and is seized with tongs by boys, pulled straight, and left to cool. One of the especial advantages gained by rolling the rod a second time, in addition to giving it the form necessary for making the nails, is that the material is rendered much tougher and more homogeneous thereby. Each rod which was originally eighteen inches in length is, after rolling, six feet long.

The iron is now in the shape of a slender strip with a series of prominences on one side. Each prominence is about one and one quarter inches in length and separated from the others by an interval of about three and one half inches these dimensions varying with the size of nail to be made. The rod is then passed while cold into the flattening machine, which affects only the prominences, making them nearly square in section, and afterwards into the cutting machine, which cuts it into lengths. In the latter apparatus there are three blades, two of which are at right angles to the rod and cut straight through the center of a prominence, dividing it into two nail heads, and a central knife which is set skew



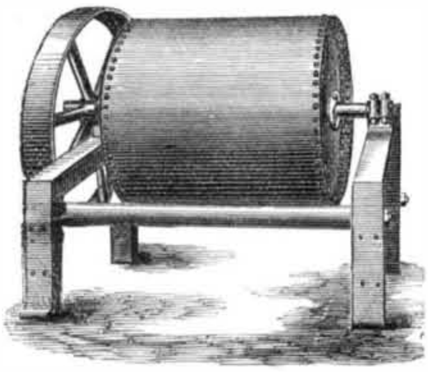
THE FLATTENING MACHINE.



THE CUTTING MACHINE

to the rod and divides each shank into two beveled points. The pieces thus formed, called nail blanks, are placed in the rumbling machine, a revolving sheet iron barrel, the motion of which causes the blanks to clean and polish each other by friction.

The finishing process follows, calling into use the heading and shaping machines. The first of these consists of a massive die, which rises and falls in a vertical direction. Beneath it a wheel turns intermittently on a horizontal axis, and from the circumference of this wheel project several pairs of dies, which receive the nail blanks with the heads upwards. When the vertical die descends it meets one of the pairs of wheel dies beneath it, ready to receive its stroke. When it rises, a partial revolution of the wheel takes place, and the next pair of wheel dies is ready in its turn to receive the next blow. The wheel dies consist of blocks of iron hollowed out on their opposing faces to receive the blanks, and hollowed at the top so as to give proper space to the heads. The blocks are kept at a little distance apart by springs inserted between them, so that they hold the nail blank loosely, but as each pair in succession reaches a vertical position, and just before the plunger descends, a pair of jaws closes upon the blocks and presses them tightly together, so that the blank is firmly fixed while being struck. As the plunger rises the hold of the jaws is released. and the blocks are separated by the springs. During the revolution of the wheel each pair of blocks receives, in its turn, a blow from a hammer, which loosens the nail blank so that it falls out as soon as its head turns downwards.



THE RUMBLER.

After being thus roughly headed, the unfinished nails are transferred to a Siemens annealing furnace, and thence passed to the shaping machine. In this apparatus they are placed singly but successively on the perimeter of a wheel. They are prevented from falling off by stops, and are compressed between a descending plunger and two lateral dies, which remove all irregularities and produce a nail of perfect finish and form. One more process yet remains to be accomplished. It consists in placing the nails, five hundred weight at a time, in cast iron pots, which are ranged in a furnace. As soon as the nails become red hot they are emptied out upon concrete floor and left to cool. A thin film of oxide is thus formed upon their surface, which effectually prevents them from rusting.

These machines, with the exception of the rolling mill, are all attended by girls. The cutting machine can cut over 30,000 nails per day; the maximum number ever reached was 37,000. One girl, sitting at the heading machine and feeding it, can turn out 24,000 nails in an ordinary day's work.

Horse nail making by machinery in this country, as well as in England, has become quite a large industry, being carried on by the Au Sable Horse Nail Company, of Keeseville, N.Y., the National Horse Nail Company, of Vergennes, Vt., the Globe Horse Nail Company, of Boston, Mass., a company in New London Conn., and other localities. We hope before long to illustrate and describe the Kingsland patent machinery and processes, owned and operated by the Northwestern Horse Nail Company, of Chicago.

Aniline for Printing Black.

The degree of purity of commercial aniline, says the *American Chemist*, is of the greatest importance in the manufacture of different colors, and especially of blue and black. As aniline black is developed by printers themselves and not bought ready for use, the following test will enable them to determine the quality of the article they have to use:

Any aniline oil which does not boil under 192° C. must at once be rejected; and the nearer its boiling point is to that of pure aniline, 180°, the finer will be the black color produced. For practical tests several methods may be followed. Baume's areometer gives some indication of quality. Any aniline of from 20° to 30° B. always gives a black color if not fraudulently adulterated. If heavier, it generally contains undecomposed nitro-benzol, if lighter, too much toluidine. Fractional distillation gives a more reliable result. The percentage of aniline distilling between 180° and 185° C. represents the true value of the article. Concentrated sulphuric acid diluted with three times its weight of water is also a good test. About one part of aniline is mixed with at least three parts of the dilute acid; a thick paste of sulphate of aniline is formed, and more water is added to dissolve the salt, when any tarry impurities and also nitro-benzol collect at the top.

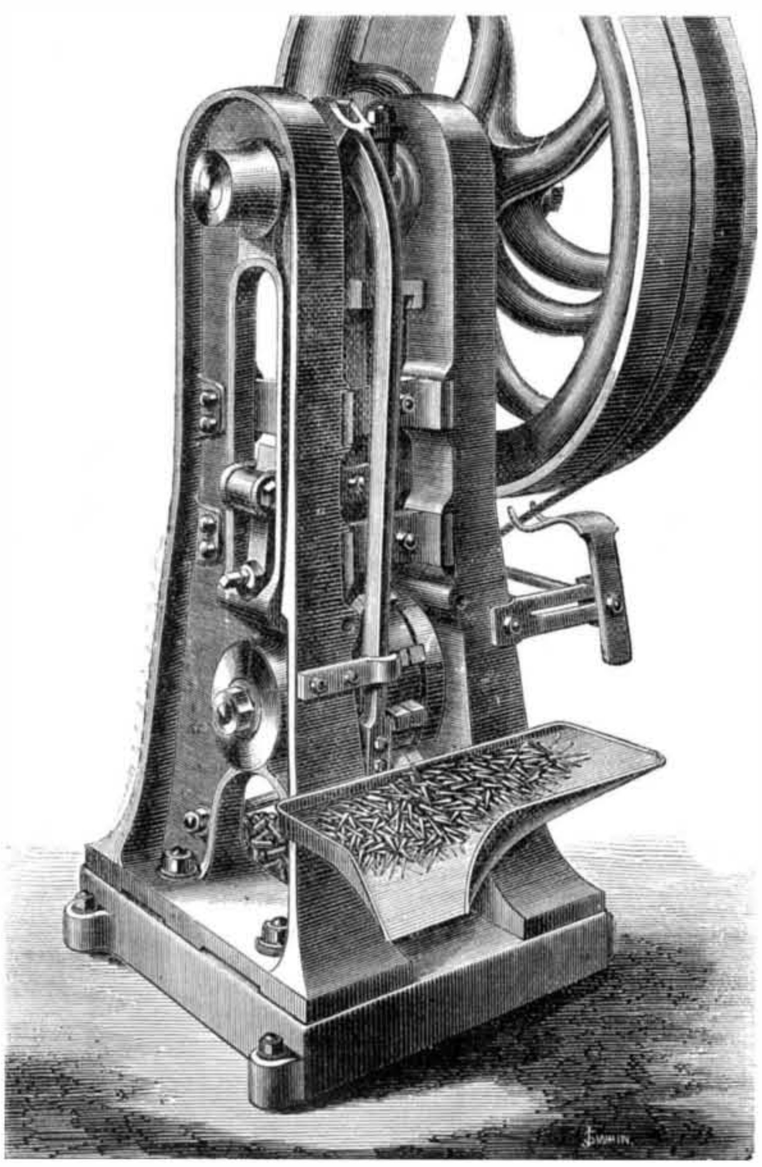
The quantity of aniline oil used is enormous, being, in 1869, 3,500,000 pounds, or about 10,000 pounds per day. Of this, Germany took two million pounds and the rest was divided between Switzerland, England and France. The quantity of coal which must be converted into gas to furnish sufficient benzol for 3,500,000 pounds of aniline is astonishing. It is estimated that 1,600 tuns of coal will produce one tun of aniline. Three and a half million pounds or 1,600 tuns of aniline require therefore 2,500,000 tuns of coal, which, in the first instance, would give 25,000,000,000 cubic feet of gas.

Dynamical Theories of Heat.

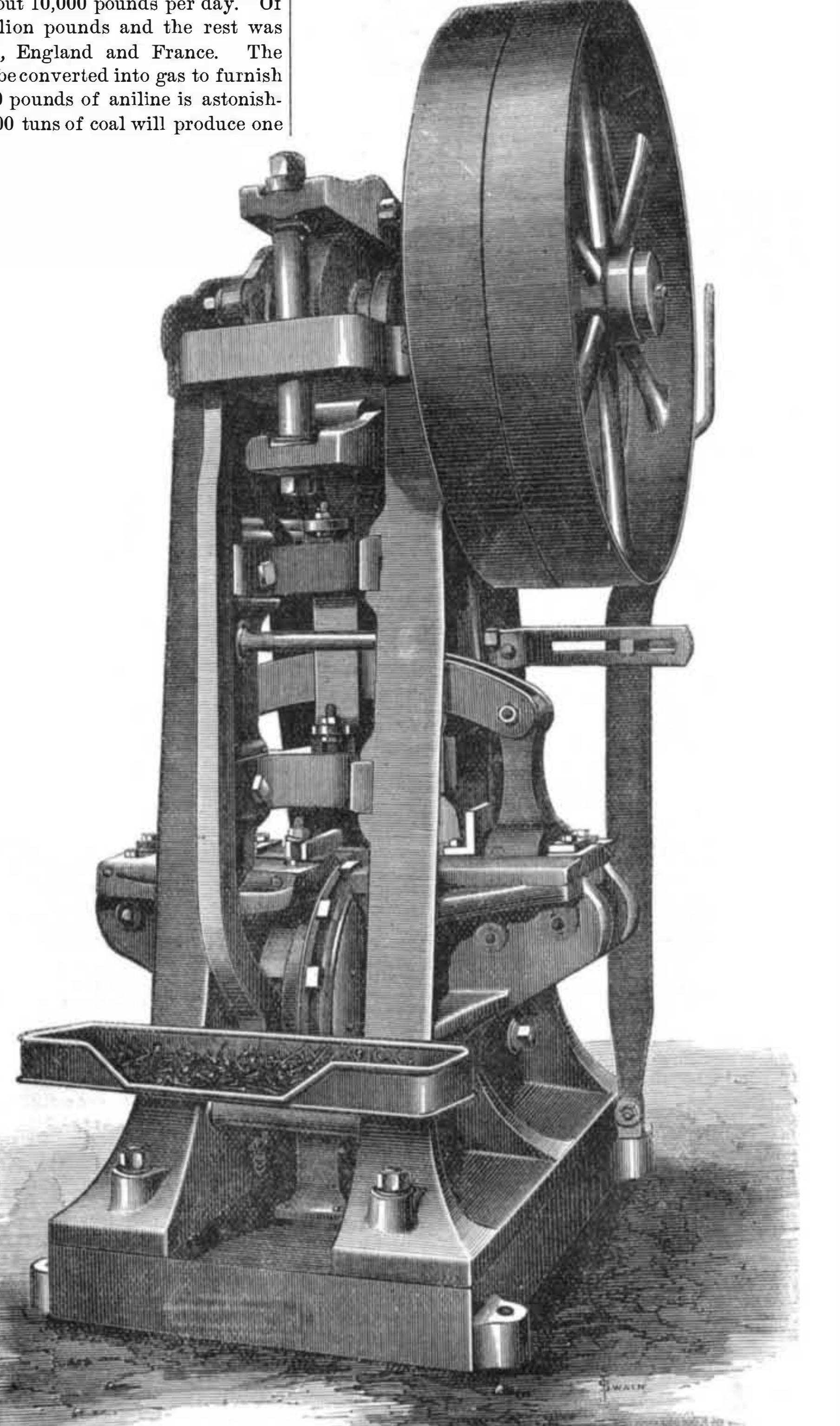
Professor W. A. Norton publishes in the *American Journal of Science and Art* a lengthy treatise on the above topic, more especially in answer to the query: Is heat any mode of motion of the atoms of ordinary matter: such atoms being regarded, in accordance with the common notion of an atom, as incapable of experiencing any change either of form and dimensions or in the intensity of their acting forces? The conclusions arrived at are that the atoms of bodies must be made up of distinct parts, bound together by certain forces; and that heat must consist in some movement or relative displacement among these constituent parts of the atoms. Two possible conceptions of an atom with its essential accompaniments are given: That it consists of a true atom, surrounded solely by an atmosphere of luminiferous ether, or that it has, in addition, an envelope of distinct electric ether immersed in the ethereal atmosphere. In view of these results, it is considered probable that heat and light originate in some mode of motion occurring in the ethereal atmosphere or in the electric envelopes of the atoms, or more probably, in the force or forces by which such a movement is produced.

Simplified, Professor Norton's theory, though at first conveying the negative idea of a complex atom, transfers the source of heat from the atom proper to a supposed ethereal atmosphere or electric envelope, one or both, and therefore, following the hypothesis, to a form of matter considered to be nearly, if not quite, as subtle as the medium of light, and whose elastic forces are nearly or quite as intense.

WILLIS WILLIAMS, of Islesboro', Me., was out on the ice hunting seagulls, when an accidental discharge of his fowling piece wounded him so badly in the thigh that he could not walk. He smeared the dog's face with blood and told him to go home, which the sagacious animal did, and by signs and the blood alarmed the family, who followed him to the place where the young man was lying.



THE HEADING MACHINE.



THE SHAPING MACHINE