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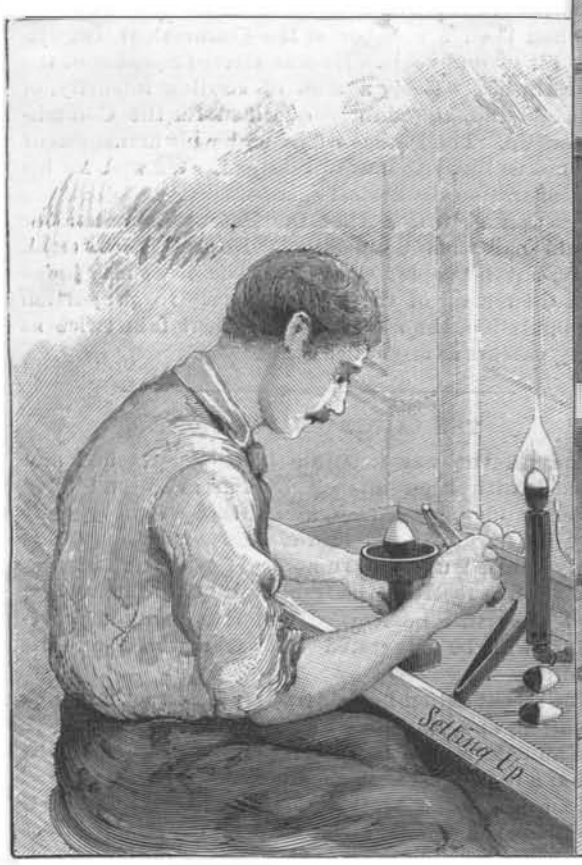
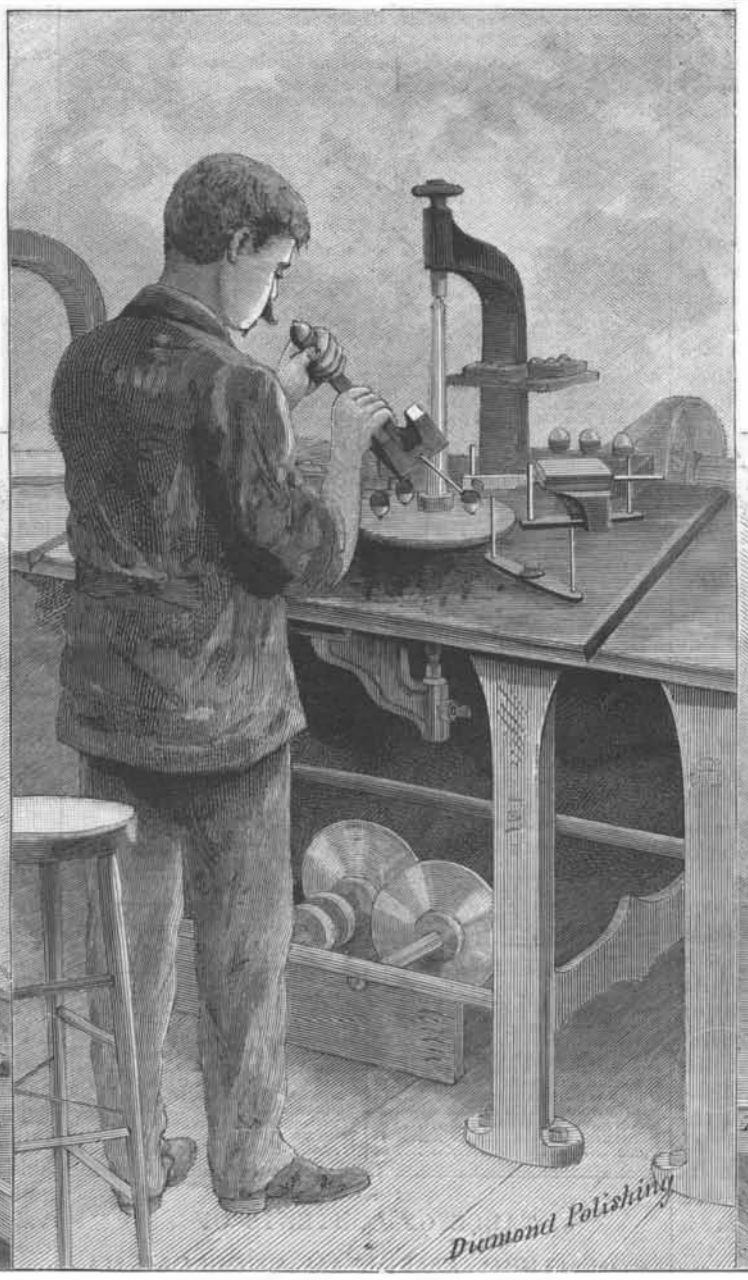
DIAMOND CUTTING BY HAND AND MACHINE.

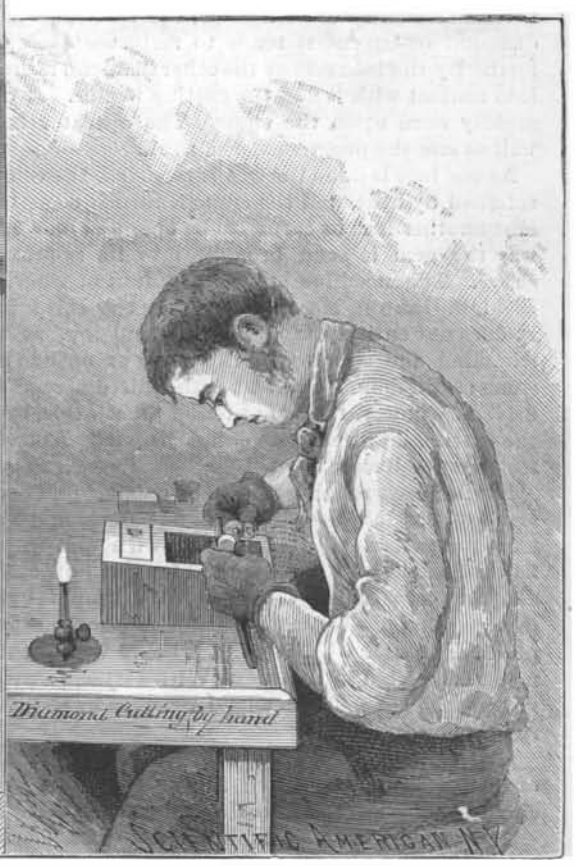
Modern diamond cutting is an art which for many generations was practically confined to one city, Amsterdam. In India the natives cut the gems, but they did not follow the rules of shape which have found acceptance with the Caucasian nations. Some twenty years ago the industry was introduced in this country. This was at about the time of the discovery of the South African diamond fields. Mr. I. Herrmann, a jeweler of this city, succeeded in finding among the Dutch who had immigrated to this country a number of diamond workers who from force of circumstances had abandoned their trade and had adopted other occupations.



CLEAVING.



POLISHING ON HORIZONTAL WHEEL.



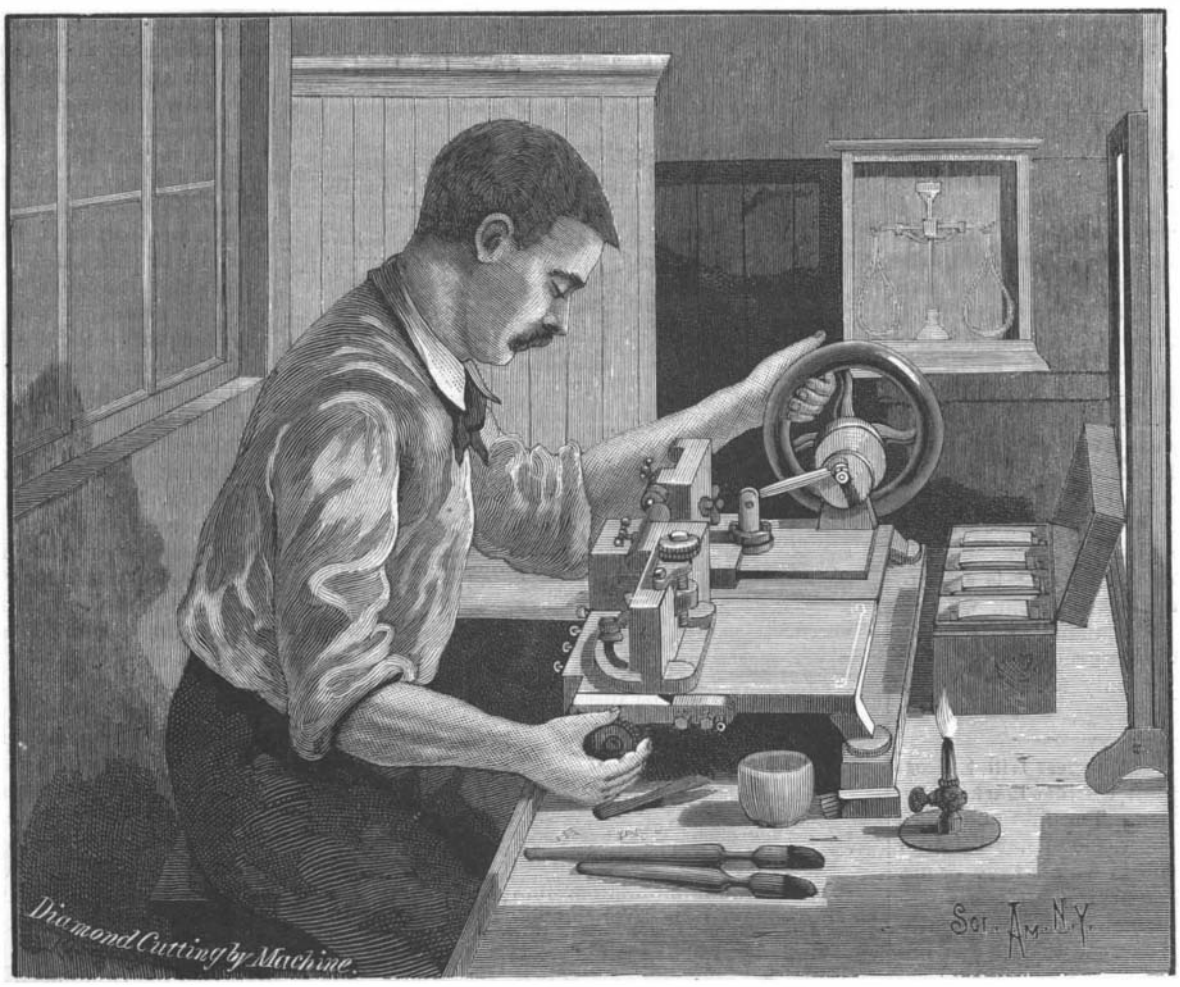
HAND CUTTING.

He opened a shop in this city, where much work was done.

The industry spread more or less, and is now firmly established in several places in the United States. The jewelry firm of Tiffany & Co., of this city, among others, have in operation a shop in which diamonds are cut and polished from the rough, and are recut when the original cutting as performed in Amsterdam or elsewhere has not left them of satisfactory brilliance. The work is in charge of the foreman, Mr. Geo. H. Hampton, to whom we are indebted for attentions shown in connection with this article.

The operations of shaping a diamond are three, and may be four, in number: cleaving, cutting, setting and polishing. Each operation is a trade by itself, and very few ever learn to do more than one or two of the four steps. Cleaving is often dispensed with; the other three are necessary. The favorite shape into which every stone of any value is worked is the brilliant. This consists approximately of two truncated pyramids placed base to base. The line dividing the two pyramids is called the girdle. The upper portion is the crown, with a flat face called the table on top. Below the girdle is the collet. If properly cut, this shape brings out the fullest possible brilliancy of the gem. So important is this quality, that it was deemed advisable to recut the Kohinoor diamond to develop its brilliancy, although many karats were lost in the operation.

Cleaving consists in splitting off pieces of a diamond. By inspection striations can be detected in the rough gem by which its cleavage plane is determined. The stone to be thus treated is mounted in cement upon the end of a wooden handle. Upon a second handle a sharp-edged fragment such as has been cleaved from another diamond is mounted. The diamond has a little notch made in it by the cleaver pressing and rubbing against it the edge of the fragment. This marks the place for starting the cleavage. A cutting box is used in making this notch. This is shown in the illustration in use for regular cutting. It is a small metal box from whose edge two brass pins or studs rise, against which the spindle-shaped handles are pressed in the cutting operation. The cleaver holds a handle in each hand, pressing them firmly against the pins and edges of the box. The ends carrying the diamonds project over the box. He then scratches or cuts a notch at the desired place. Next, placing the handle carrying the diamond to be cleaved on its end upon the table, he holds a blunt-edged knife of steel firmly upon the notch and gives the back of the knife a



THE FIELD DIAMOND CUTTING MACHINE.

DIAMOND CUTTING BY HAND AND MACHINE.

gentle tap with an iron rod. The piece at one blow splits off and leaves a bright face. Considerable skill and judgment are needed to perform this critical work, but it is by no means such a mystery as it has been represented to be.

The cutting operation is conducted with heavier handles over the cutting box just described. One diamond is rubbed against another, both cemented on the ends of handles, over the box, and the abrading goes on rapidly. Here a peculiar skill is needed to give the right stroke. Without it true cutting will not be effected. The left hand stone is the one which receives the final cutting; the right hand stone gets its first rough shaping only. The box has a movable receptacle below to receive the dust. A fine wire gauze screen is above it, to catch any cement which may fall.

A machine has been introduced for performing this work which is in constant operation in the Tiffany shop. It is essentially a planing machine. It contains a fixed adjustable abutment and a reciprocating abutment forming a species of slide rest. These correspond to the right and left hand handles of the hand cutter. The diamond receiving its final cutting is secured by cement in a cup with spindle, which spindle is inserted into a hole in the left hand carriage or reciprocating slide rest. The right hand abutment receives a second cup, with the cutting diamond held in it by cement. Quadrant adjustments and feed screws are provided for shifting the fixed abutment in any desired direction. By turning the hand wheel back and forth through a small arc of a circle, the carriage with the diamond to be cut is made to reciprocate back and forth. By the feed screws the other diamond is brought into contact with it and the cutting begins. A face is rapidly worn upon the stone. The operator feels as well as sees the progress of the work.

As one face is done the cup is removed, the cement is softened by heat, and the stone is turned so as to present another face or corner to be operated on. In this way the gem is soon brought into its approximate shape. The machine is the invention of Charles M. Field, of Boston, Mass., and is only the third in use. It does not entirely supplant hand cutting, as much trimming and shaping of the girdle or outline of the stone is still done by hand. Although designed to be driven by power, this is not found practicable, because the cutting, as already explained, is partly a matter of feeling as well as of sight.

Having been roughly shaped by cutting, and perhaps also by cleaving, the diamond has next to be set in alloy for polishing. A brass cup with a copper wire handle, called a "dopp," is used for this purpose. An alloy of lead and pewter is used to fill it and is built up in acorn shape. When of the consistency of putty, like plumber's solder when a joint is being wiped, the diamond is inserted in the apex. With a stick, or with the fingers, the hot metal is wiped away, so as to give the right exposure.

After cooling it goes to the polisher. The wire stem of the "dopp" is fastened in the end of a wooden clamp. The operative in the upper central figure is seen holding one and examining the diamond in the "dopp." The clamp is next placed on the table steadied by a couple of pins secured thereto. A horizontal disk of iron cut or scratched in approximately radial grooves is mounted in the center of the table, and rotates at a speed of 20,000 to 25,000 revolutions per minute. The speed is so high and the motion so steady that the disks seem motionless. As the clamp is placed on the table, the diamond at its end rests upon the disk. The latter is charged with olive oil and diamond dust from the cutting boxes. After a few seconds the polisher removes the clamp and examines the stone. By pushing the cup he bends the wire one way or the other, so as to get a proper bearing. One or two trials are made. When all is right some lead weights are placed upon the clamp and it is left to itself. The polishing, which is really cutting to a considerable extent, now goes on, and lasts for a variable time, according to the work to be done.

The polisher becomes very expert in seeing what is going on by inspecting the diamond, as well as in detecting by the feel of the clamp how the diamond is resting on the disk. Even the bending of the wire of the dopp requires considerable skill.

The modern system of diamond cutting is said to have originated in 1456, with Louis Bergnen, who established a regular guild of diamond cutters at Bruges in 1470. Since then the art gradually centered itself in Amsterdam, and now only is beginning to spread to other cities.

MR. A. STANLEY WILLIAMS, of Burgess Hill, Sussex, has discovered three delicate but distinct markings in the equatorial region of Saturn. The first and third of these are round bright spots, somewhat brighter than the white equatorial zone in which they occur. The second is a smaller dark marking on the equatorial edge of the shaded belt which forms the southern boundary of the white zone. Mr. Williams has obtained abundant proof of the reality of these markings, but points out that it requires patience and practice to see them readily.

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(Illustrated articles are marked with an asterisk.)

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THE COMMISSIONERSHIP OF PATENTS.

The Hon. Charles E. Mitchell, who for the last two years has served as Commissioner of Patents, has resigned the office, and the Hon. William E. Simonds, of Connecticut, has been appointed to the position.

The retirement of Mr. Mitchell may almost be regarded as a calamity to the Patent Office. His administration has been highly successful, has given great satisfaction, and from beginning to end has been conducted with consummate ability. His rulings and decisions, always promptly given, have been distinguished for their judicial clearness and reliability. Fair and impartial hearing and consideration of both sides of the presented case has been his habit. Subject to a just regard for the public interests, he has administered the office for the benefit of inventors, for whose encouragement it was created. The progress of the Patent Office under Mr. Mitchell's guidance has been very marked. He has instituted many changes and reforms of most beneficial character. His superior administrative skill has enabled him to advance and improve the efficiency of the bureau; and in this flourishing condition he takes his leave, much to the regret of subordinates, practitioners, and all with whom he has had official relations.

William E. Simonds, the newly appointed Commissioner of Patents, is forty-nine years old and a practicing lawyer of Hartford, Conn. He also fills the lectureship on patent law at the Yale Law School, and is the author of several books on subjects pertaining to patent law. He was a member of the LIst Congress and had been a member of the Connecticut Legislature for several years. He was elected Speaker of the House in 1885. He is a man of sterling integrity, of judicial mind, abundantly qualified for the Commissionership. The Patent Office under his management will not be likely to move backward. We wish for his administration the utmost success.

It is perhaps fitting that the Patent Commissioner should hail from Connecticut. In area it is a small State, but its people have large heads, if we may judge from the records of the Patent Office. In proportion to population, the sons of Connecticut take twice as many patents as any other State.

THE CALDERA NAVAL FIGHT.

The present war in Chile is being watched and studied with keen interest by our army and navy officers and many others, and, although the reports from that country are now meager and the truth is badly snarled up with rumors, yet when reliable information is received the result will be that many useful lessons will be learned and that many improvements will be suggested in war material and its handling.

The recent action in Caldera Bay is attracting much attention, and, now that we have the report of so reliable an officer as Admiral McCann, we can study the action a little closer. The admiral's report is dated Valparaiso, Chile, April 29, 1891, and according to it the Blanco Encalada, a war ship in the service of the insurgents, was lying at anchor in the harbor of Caldera, when she was attacked about 4 A.M., of April 23, by two torpedo cruisers, the Almirante Lynch and the Almirante Condell, in the service of the Chilean government. The Encalada was sunk by the explosion of one or more torpedoes fired by the torpedo cruisers, and about one hundred and fifty men lost their lives.

The first point that strikes one, in reviewing this affair, is the statement that "the morning of the attack was perfectly clear, the light in the lighthouse burning brightly, and the ship's lights perfectly visible, so that the torpedo boats had no trouble in making the attack." The question arises, Why did not the Encalada sight the Lynch and Condell in time to make preparations to give them a warm reception, and why did she not make such preparations?

"The commanding officer admits that he alone was to blame for the catastrophe." What an admission, and what manner of man this commanding officer must be! We have an old lesson forcibly illustrated right here—that a ship may be well found in every particular, having the most modern appliances and most perfect machinery, and yet, if that very important equipment, the captain, is inefficient or unequal to his trust, the ship is a hopeless failure and her loss is to be expected. As we must have skilled mechanics to run complex machines, so must we have skilled and reliable officers to handle our war ships.

"The usual precautions adopted in time of war were entirely neglected," and it might be added that many of the precautions usually adopted in well regulated ships in time of peace were also neglected. Had a proper lookout been kept, had a signal station been established on the point, there is no doubt but that the Encalada would have known of the approach of her enemies in sufficient time to have cleared ship and gotten ready for action. Had the guns been loaded and had the cable been ready to slip, she might have inflicted such an amount of damage to the Lynch and Condell, and might have so maneuvered, as to render