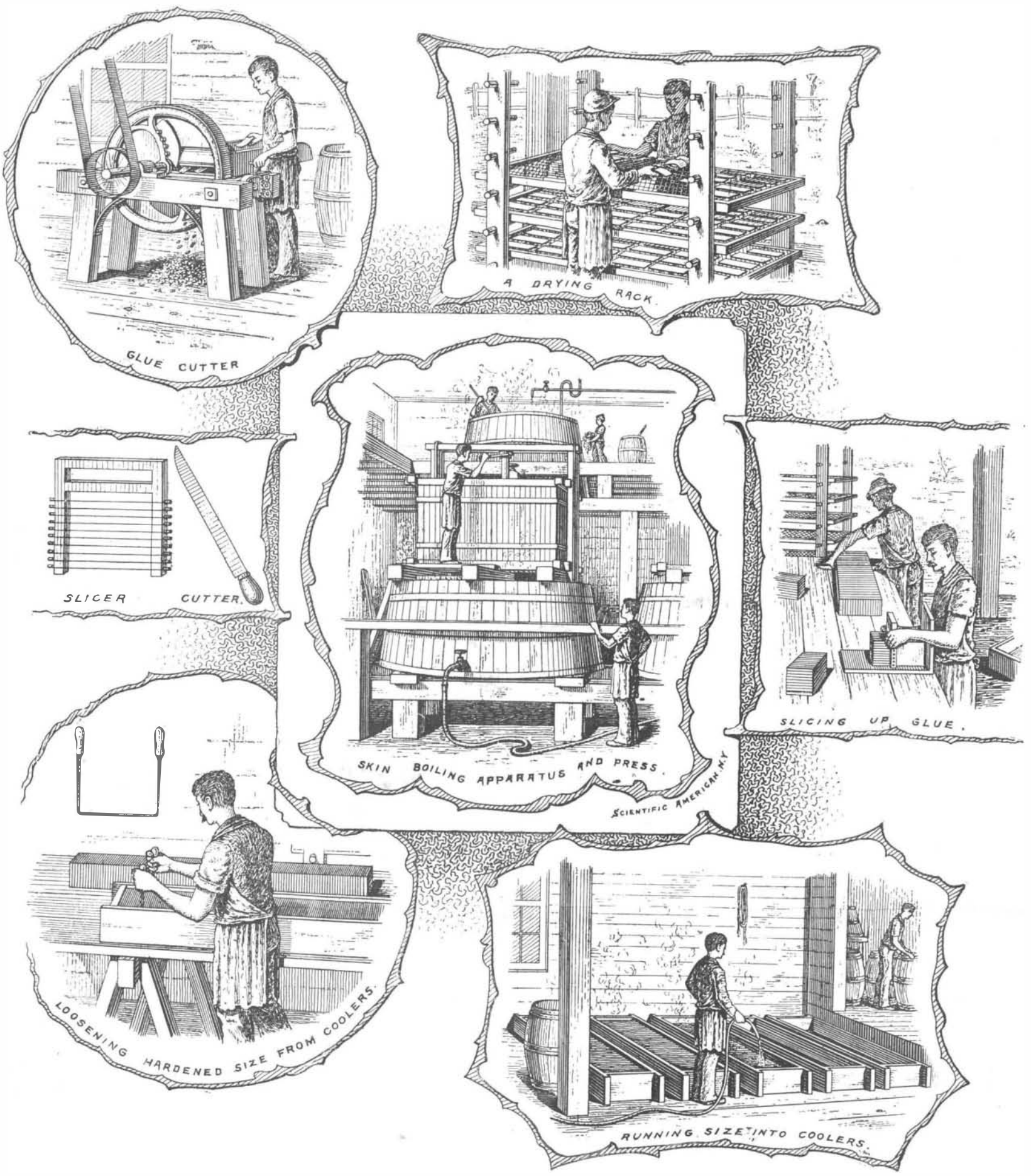
MANUFACTURE OF GLUE AND SIZING.

Glue is a form of gelatine which, on account of its impure condition, is employed only as an adhesive medium for wood, leather, paper and other substances. The gelatine-yielding substances are very numerous, comprising the skins of all animals, tendons, intestines, bladders, bones, hoofs and horns. In the preparation of ordinary glue the materials used are the parings and cuttings of hides from tan yards; also the ears of oxen and sheep, skins of rabbits, hares, cats, dogs and other animals. The material first passes through a boiling and straining process and then run into coolers, where it thickens into a jelly. The material is then taken out and cut up into slices and dried on frames of wire netting in the open air. The best time for drying is in the spring and autumn, frost and strong dry heat being injurious to the material. The plant from which the illustrations were taken manufactures glue principally from Australian and Russian cony rabbit skins. These skins are sold by hat manufacturers, after the hair has been extracted, to the glue makers in a shredded form. The glue and sizing are used principally by wall paper and window shade manufacturers, the sizing being run into barrels and sold in a jelly form. The material comes packed from the hat manufacturers in 4,500 pound bales, the shreds running about one-sixteenth of an inch in thickness and from 6 to 7 inches in length. The first process is the boiling operation. This is performed by putting about 350 pounds of the shredded skins into a wooden vat about 5 feet in diameter and about 5 feet in height. About 400 pails of water is then poured over the material and the mass allowed to boil for about 2 hours, the substance stirred up about every 15 or 20 minutes to keep it from settling. The boiling process thickens the water to about the consistency of molasses and is of a brownish color. It is then run off from the bottom of the vat into a press and strained. The press is about 4 by 4 feet square and about 3 feet in height and made of wooden slats. The sides and bottom of the interior of the press are first covered with heavy bagging. The material is then run from the vat and another piece of the bagging placed over the top of the fluid, over which a board covering is placed. The material is then strained or pressed out through the bagging and between the slats of the press by means of a hydraulic jack. A pressure of about 20 tons strains the material in about 2 hours.

From the press the hot liquid or size drops down into a receiving vat below. From this vat it is run by means of a hose into barrels holding from 450 to 500 pounds each. After each barrel is filled it is allowed to cool for from 8 to 10 hours until a skin is formed over the top. A cake of ice is then put on top of the size, if the weather is warm, which hardens it to about the consistency of jelly. In this condition it is sold to wall paper and window shade manufacturers. To keep the size from decaying, an acid preparation is added before the straining process.

For hard glue the hot size is run into coolers. These coolers are made of wood and are lined with zinc. They are about 6 feet in length, about 1 foot in width and about 6 inches in depth.

The coolers, which hold about 125 pounds each, are filled to within 1 inch of the top and are allowed to stand for about 12 hours. They are then brought to the drying shed and the material loosened from the box. This operation is performed by means of a piece of ¼ inch wire made to conform to the shape of the bottom and sides of the cooler. The operator presses the wire down to the bottom of the coolers at one end and draws it along the sides, cutting and loosening it, so that by turning the cooler over it can be taken out in a solid mass. This 6 foot cake of jelly size is then cut up in small cakes about 4 inches in thickness and passed to the slicer. These cakes are turned over on their sides and sliced lengthwise into small strips about 12 inches in length, about 4 inches in width and about ½ of an inch in thickness. The slicing is performed by an apparatus consisting of a number of fine pieces of wire stretched tightly across an iron frame about ½ of an inch apart, the operator drawing the wires through the material, cutting or slicing it up into a number of strips. The strips are then placed upon



MANUFACTURE OF GLUE AND SIZING.

drying frames. These frames are about 5½ feet in length and about 2 feet in width and are made of galvanized wire netting. The frames when filled with strips of glue are placed in racks about 8 inches apart, so that the air can circulate through them. The frames hold about 20 pounds each, the strips being placed so as not to touch each other. In a good, dry cool west wind the strips of glue will dry in about 1½ days.

During the drying process the cakes of glue shrink up about one-half. When the pieces have become quite hard they are washed, to remove dust from the surface and give them a glazed and polished appearance. A good quality of glue should be free from all specks and grit and should have a light brownish yellow transparent appearance and should break with a glassy fracture. Under the influence of heat it entirely dissolves in water, forming a thin sirupy fluid with a not disagreeable smell. The cakes when thoroughly dry are cut up into small pieces by means of two revolving knives traveling at the rate of about 300 revolutions per minute. The pieces of glue are first passed between two 4 inch toothed rollers which hold them in position, and also drawing them forward after each stroke of the knife. The pieces of glue are then packed into barrels ready for the market. Twenty-five hands can turn out 40,000 pounds of sizing per day and 25 tons of hard glue weekly. The sketches were taken from the plant of Charles De Clyne, New Durham, N. J.

THE THORNE TYPESETTING MACHINE.

(Continued from first page.)

load 6,000 ems of minion. Type used in the machine is the same as used for hand work, but is prepared for use in machines by being nicked on the side opposite the foundry nick, each character, space and quad having a combination of nicks peculiar to itself. This putting of nicks in the type is a very inexpensive and short job, for which the company have special machines. Each channel in the lower cylinder, which is stationary, is fitted with a combination of steel "wards" on one side, and the combination of nicks of one particular type, character or space corresponds with the combination of wards in one channel of the lower cylinder only, as shown in the sketch illustrating the work of distribution. The milling machine for cutting the channels in the cylinders was specially made by the company for this work, as were many of the other tools required in the production of the machine, it having been found impossible otherwise to obtain machines which would do work of the high degree of exactness and nicety required.

The distributing cylinder, having been loaded with matter for distribution, revolves with a step-by-step movement, each step bringing the different channels of the distributing cylinder into exact coincidence with the channels of the lower cylinder. The lowest types in the channels of the distributer, when brought over channels in the lower cylinder having combinations of wards corresponding with the combinations of nicks in their sides, drop into such channels, a spring in each channel insuring their positive movement when the right place is reached. They cannot go into any channel except that for which they are nicked; and as the channels, by the rotation of the cylinder, are made to coincide, or match, one hundred and twenty times per minute, and as frequently several characters find their respective channels at the same step of the distributer, over 10,000 ems can be automatically distributed in an hour.

It is a simple matter to take out surplus type in any channel when an excess of a particular letter has been distributed, or to replenish when a sort is exhausted before distribution supplies it. These surplus sorts are kept in type founders' galleys placed in a cabinet convenient to the machine, such galleys and cabinets being furnished with machines.

The keyboard resembles that of a typewriter, except that it is larger and has more keys. The keys are connected by levers, etc., to plungers, the ends of which when at rest are immediately behind the bottom letters in the channels of the lower cylinder. Immediately in front of and with its surface level with the bottom of the lines of type in the channels of the lower cylinder is a revolving disk, the axis of which is the same as that of the cylinders. The disk revolves rapidly from left to right, and, when the operator touches a key, the plunger to which it is attached ejects the lowest type of the corresponding channel out upon the disk, by which it is carried to the right hand side of the machine, where it is received on an endless belt, which carries it to a lifting apparatus, called the packer, which raises each successive letter into proper position in a continuous line. The marvelous accuracy and nicety of this operation is one of the phenomenal features of the machine. As one type follows another, the line is pushed along across the front of the machine, between the keyboard and the lower cylinder, through a channel called the typeway.

At the left of the keyboard is the second operator, who has before him a case containing spaces, quads, extra sorts, leads, etc., and separates with a grab set to the required measure as much from the continuous line of type in the typeway as will form a line of the measure required by the newspaper column or book page in process of composition, changing such spaces as it may be required to fill the line, and inserting hyphens when a division of the last word of the line makes this necessary. As the justifier reads the line while spacing it out, and corrects any errors he may find therein, the type set by the machines is remarkably free from errors where operators have become expert. Any errors which may have escaped the attention of the justifier are as readily corrected on the galleys as is ordinary hand-set matter.

The power required to drive each machine is very light, three to five machines being driven by one horse power electric motor. The machine is driven by two light belts, one of which transmits power to the revolving disk and the other parts of the setting apparatus, and the other, by means of an eccentric shaft and pawls operating on an index ring attached to the top of the upper cylinder, produces the step-by-step motion of the distributer.

The factory of the company, where all the machines are made, is at Hartford, Conn. One of our views represents one of the rooms in which the assembling of the parts and setting up of the machine is carried on. It has required several years' work to bring the machine to its present state of perfection, with adjustments so accurate and parts so nicely fitting, and withal working so easily that wear and the possibility of breakage are practically eliminated. All parts which occasion may require to be removed for cleaning or for adjustment may be readily removed by taking out thumb screws or bolts, thus avoiding the use of tools, and the cost of keeping the machine in good order after it has been once set to work, hardly figures at all in the running of one of these machines. The factory is at present turning out five machines a week, and there are over 500 machines now in use. They are sold for $1,800 each.

As will be readily understood, a different machine is required for each size of type, i. e., a brevier machine, an agate machine, a minion machine, a pica machine, etc. In all offices where special attention is paid to "style," and where fine work is a particular object, the advantages of the Thorne machine will be at once obvious to every printer, for, although the machine itself has so large a number of compartments for letters and characters, it is a very simple matter for the justifier to place italics or accented letters, chemical, mathematical, or other symbols, wherever desired, all the characters known to a printing office being as readily available for use in the composed matter as they would be in the work of composition by hand. And the perfect faces furnished by the skilled typefounder, for which a printer of the best class of work is always on the lookout, are always available for use in the machine, which is thus adapted to turn out, with greatly increased facility, every class of work within the range of the largest and best equipped offices.

History of the Electric Telegraph.

An interesting series of articles has been contributed recently to the Electrical World by Franklin L. Pope, concerning the history of the invention of the electro-magnetic telegraph. A large amount of evidence is presented in these articles on behalf of different claimants, and the author sums up as follows:

1. The first electro-magnetic apparatus for producing at will audible sounds at a distance was invented, constructed and operated by Joseph Henry in Albany, N. Y., in 1831.

2. The first electro-magnetic telegraph for producing at will permanent written marks at a distance was invented by Professor S. F. B. Morse in 1832, and constructed and operated by him in New York prior to September 2, 1837.

3. The first code of numerical conventional signs capable of being intelligibly written or sounded by the armature of an electro-magnet was originated by Morse in 1832.

4. The first code of alphabetical conventional signs capable of being intelligently written or sounded by the armature of an electro-magnet was originated by Alfred Vail in 1837-38.

5. The relay and combined circuits was invented by Morse prior to September 4, 1837.

6. The lever key, in its modern form, was invented by Vail in 1844.

7. The dry point recording register was invented by Vail in 1843.

8. The inverted cup of glass for insulating the line wire was invented by Ezra Cornell in 1844-45.

It may be that other documents, in existence and hitherto unknown to historians, may come to light in future years which will materially change the aspect of the question as it appears at the present time, but it has been my desire and intention in what I have here written, in the words of Henry, to render according to the present evidence scrupulous and exact justice to all who were concerned in the invention of the electro-magnetic telegraph. The development of this wonderful agency has been from first to last a characteristic and typical example of the great law of evolution, beginning with Henry's apparatus of 1831, and ending, at least until a recent date, with the familiar key and sounder of modern telegraphy. The work of Morse marks only an important and indispensable era in this process of evolution, not its ultimate conclusion, as many writers seem to have somewhat hastily assumed. Yet, in the gradually increasing use of the automatic system of transmission, probably destined to become universal in the future, we may recognize the possibility of a complete reversion to the original scheme of Morse, in which the alphabetical code will be the sole survivor among the contributions of others than himself to the general result.

The Trolley System in St. Louis.

A correspondent of the Evening Post says: A street railway president in this city remarked to day:

"The general introduction of electricity as a motive power has brought the officers and men of the street roads into closer relation than that they sustained under the old system. The primary cause of this is that it takes a higher order of intelligence to manage a trolley than it does to drive a mule. We have regular schools of instruction now which the men must attend, and this has brought the best of them forward. Ability is quickly detected by the questions asked and the interest taken, and wherever ability is found it is marked for promotion. One result of the school of instruction is that it is steadily reducing the percentage of accidents, and we expect to get this average below the old average on horse car lines. Under the regime of the trolley drink has been absolutely prohibited among employes, and the well remembered mule-whacker, whose capacity for whisky was only exceeded by his versatility in profanity, is of the past. He has been weeded out. It is an indisputable fact that a far better class apply for the position of motorman and conductor than were in the habit of seeking employment as driver or conductor. It is a sort of scientific job now, and not a few fare collectors have by dint of study and observation become pretty well informed electricians."

A mammoth generator and twin engines are being placed in the power house of a local company. Mr. Scullin, vice president of the line, when asked if it was made necessary by increased traffic, said:

"Not altogether. In the winter we expect to use it as a stove. We intend to heat all our cars by electricity in future, doing away with the unsatisfactory coal stove altogether."

A Land and Water Steamboat.

An interesting steamer is just about to be started on some lakes a few miles distant from Copenhagen, the peculiar feature being that the steamer has to make a short journey overland, the two lakes being divided by a strip of land. Across this a railway has been constructed, crossing a high road, which necessitates a gradient on both sides of 1:50, the metals being ordinary rails. At the two ends the rails have been carried into and under the water on a wooden structure. By means of piles the steamer is guided on to the rails, which correspond in position with two wheels fixed on each side of the steamer. The steamer goes then on to the rails at "full speed," and travels up the rails on the one side and down the incline on the other, into the water, where the propeller again takes over its function. The engine is comparatively powerful, and in addition to the usual propeller shaft there is another shaft, which, by means of a chain, works the small wheels on which the steamer crosses the rails. The boat also has a powerful brake to moderate its speed down the incline. The steamer is 44 ft. long, capable of holding seventy passengers, and the engine indicates 27 horse power. All the trials have passed off perfectly satisfactorily.

This reminds us of the celebrated Orukter Amphibolos, invented by Oliver Evans, of New York, in 1803, which traversed land and water. It was a boat provided with four wheels, for land service, and a propelling wheel at the stern for the water. It was driven by steam and operated with success.

It would rattle along over the ground until a stream to be crossed was reached, then plunge into the water, paddle across, then wheel up the bank, and away it would go. Oliver Evans was a prolific inventor.

Porosity of Glass.

That glass is porous to molecules below a certain weight and volume has been shown by recent electrolytic experiments made by Prof. Roberts-Austen, of the Royal Mint. A current was passed through a vessel containing an amalgam of sodium separated by a glass partition from mercury. After a while the amalgam was found to have lost a certain amount of its weight, while the same amount had been added to the mercury. The same result was obtained with an amalgam of lithium; but with potassium, whose atomic weight and volume are high, the glass could not be penetrated.