

of molding blocks of different design. In the building illustrated, the blocks were made to simulate with remarkable accuracy the appearance of cut stone. It is possible, however, to produce blocks in which complicated patterns are cast with an effect that would seem attainable only by the deft hand of a skilled stone-carver.

AUTOMATIC PAPER-FEEDERS FOR PRINTING MACHINERY.

In the last few years the development of modern printing machinery has been phenomenal. Larger and faster presses, labor-saving devices for feeding, folding, cutting, covering, and case-making have reduced the cost of labor charges to a remarkable degree, and the quality of the product has steadily gained. Presses traveling at a high rate of speed were built, and this speed was increased until it finally got the better of the feeder and opened a field for the automatic supply of paper to the press, thus increasing output from 20 to 40 per cent, without mentioning other advantages, such as a saving in spoilage of paper and perfect registry. Printers, while strongly organized, do not look upon labor-saving devices as an incitation to strikes for with every march of improvement wages are increased. Still it must be admitted that the paper-feeder has minimized the liability of strikes among press-feeders. The continuous use of the press adds greatly to the increase in the output. The feeders can be loaded with paper at the regular hours and the capacity of the paper trucks is very large, 20,000 sheets not being unusual. The paper-feeder is not limited in application to the printing press. It is applied to folding machines and ruling machines. The paper-feeder must not alone supply paper to the grippers of the cylinder, but must automatically control the action of the press during the whole operation. Otherwise there will be little utility in the machine. In brief, the principle of the automatic paper-feeder is as follows: The paper is placed in a pile upon a movable elevator which rises automatically as required. When the operation is started, the corners of the paper are slightly raised, the buckling fingers buckle the paper, compressed air is blown toward the center of the sheet to separate it, and the sheet is then advanced through a caliper which measures the thickness of the sheet. The calipers insure absolute accuracy.

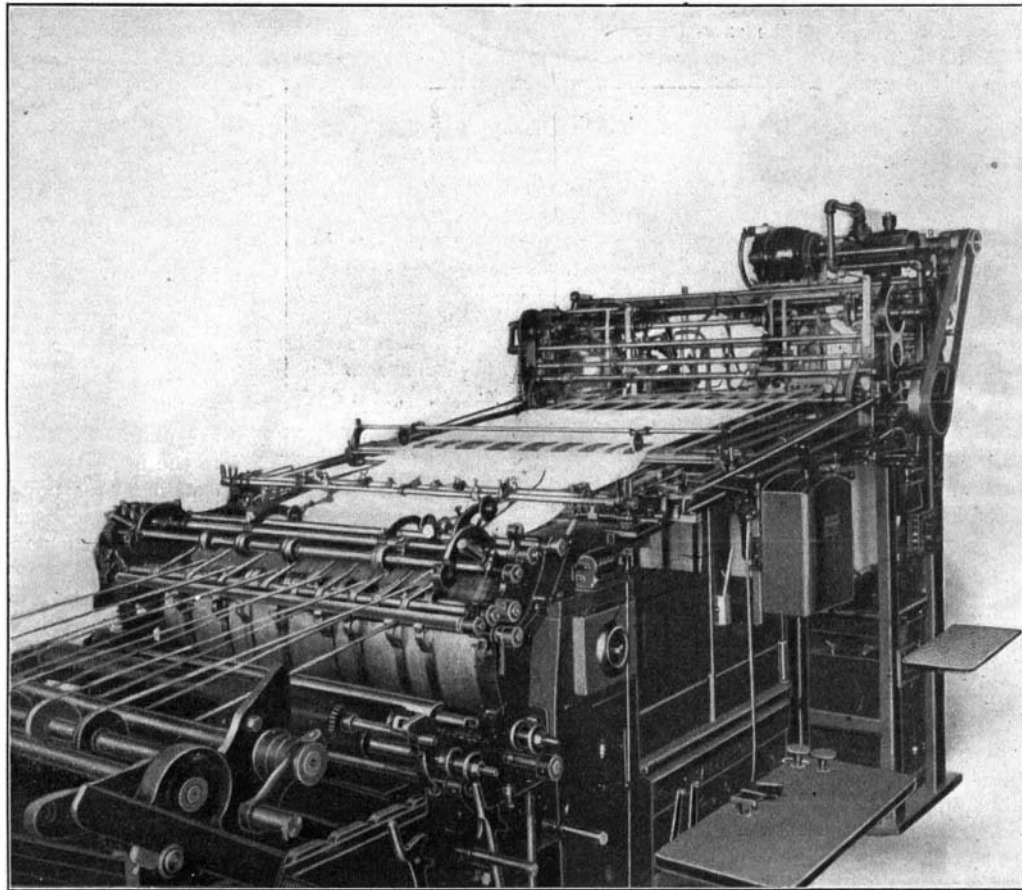
We will now take up the operation of the machine in detail. The feeder is run either by the press itself, or preferably by an independent motor, electricity being usually employed. The feeders which we illustrate are of the independent electrically-driven type, and are made by the Dexter Folder Company, of New York city and Pearl River, N. Y. Power is required to work the buckling attachments, the sheet-advancing devices, the tripping mechanism, and to run the blower. The total power employed is slight, being only 1/4 to 1/2 horse power. Compressed air is only used as an adjunct, its function being to loosen the top

sheet, after the buckling fingers have raised the corners of the sheet, which causes it to move readily on a thin skin of air. There are two bucklers, one at each side of the feeder. These bucklers are adjustable to the pile. The driving power is applied through a tele-

of the pile-elevating governor carry push fingers which travel in two distinct planes. On the forward stroke they are dropped into contact with the pile. They then advance the sheet forward on to the movable tapes, which carry it to the impression cylinder. On the backward stroke they are elevated above the pile, leaving a sheet free to be taken forward. It may well be asked what is to prevent the automatic feeding of two sheets owing to various causes, such as two sheets sticking together. This is prevented by an automatic sheet-caliper attachment which is located just beyond the sheet-advancing carriages. In brief, it consists of rollers which are very accurately adjusted; a single sheet passing between them would not cause friction enough to revolve the upper roller; but if more than one sheet enters between the rollers, the extra thickness will rotate the upper roller B, causing the pin C to tilt the pendulum D so that its upper end will be moved from another arm E, which actuates a clutch, stopping the machine. This automatic stop of the feeder takes place before the sheet is advanced on the pile more than 6 inches. The caliper does not stop the press; but it stops the feeder. The press does not stop until all the sheets are printed that have previously passed beyond the caliper. The sheets are quickly run down again from the feeder to the drop guides of the press by power before the press

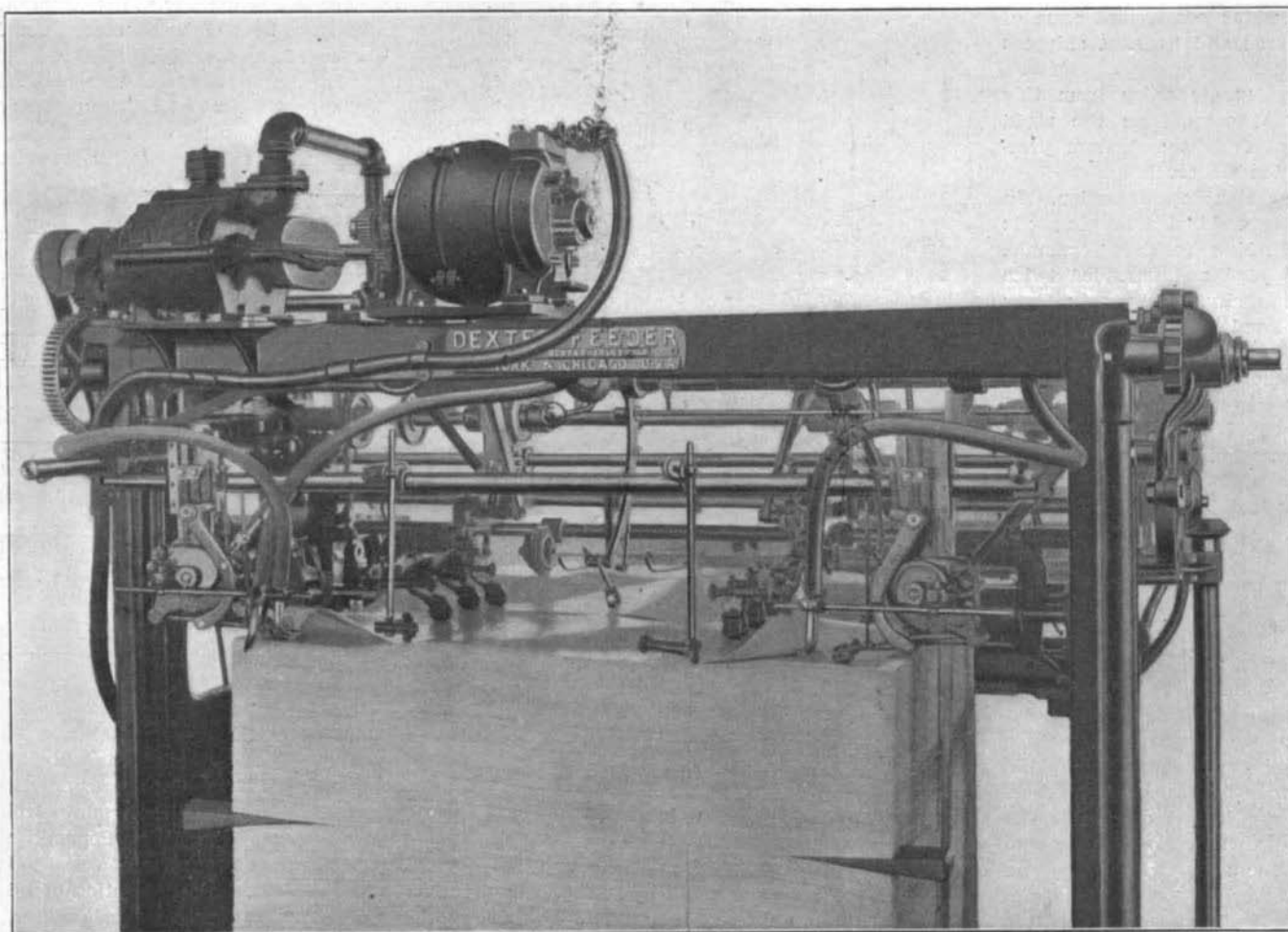
is started. This saves the spoiling of sheets, and it also prevents the possibility of blank sheets getting into a pile at the flyboard. The small roller, which will be noticed as pressing on the sheet in the center, is the pile-elevating governor which automatically regulates the height of the pile of the sheets. Through the medium of a connecting rod it controls a locking finger. The pile will be fed up until the lifting of the wheel which goes up with the pile causes the locking finger to throw out of gear the elevating mechanism. This device is so sensitive that the height of the pile will not vary the thickness of one-sixteenth of an inch.

The sheet having been fed forward by the fingers of the sheet-advancing carriage and having been calipered, is allowed to pass on its way and is moved down to the press by means of tapes. But the feeder is not finished with the sheet until it has been actually taken by the impression cylinder. In all probability the sheet has been fed forward with such precision that the registry is most accurate. Now, no chances are taken, side registering grippers being provided, which give absolutely perfect registry, which is so necessary in color work. In brief, the side register gripper consists of clamps which, in case of any inaccuracy, seize the sheet and turn it to the proper position. The sheet is now advanced toward the cylinder, the whole operation, of course, being a continuous one, one sheet following immediately the other one. Directly over the impression cylinder is a device intended to control the tripping or skipping of the impression. In case a sheet catches in delivering from the impression cylinder, the press is in-



Paper Feeder Applied to a Cylinder Press.

scopic knuckle-jointed shaft which readily accommodates itself to the various positions of the buckler. The buckling finger will move parallel with the edge of the pile, or it may be set diagonally, which best suits the paper being fed. A cam actuates a buckling finger or roll through the medium of a connecting rod. The action is very much the same as in turning the leaves of a book with the aid of a moistened thumb. A fixed finger to oppose the action of the roller helps to cause the sheet to be thoroughly separated, working in conjunction with the air blast. It will be noticed that there are three pieces of mechanism visible directly behind the buckling attachments. These are the two sheet-advancing carriages and the pile-elevating governor. The principle of feeding involved is very simple. All of the sheets, except one which is to be fed, are held back by a foot on the buckling attachment. The two sheet-advancing carriages which are on either side



Blower. Buckler. Advancing Carriage. Caliper. Buckler. Pile Elevator.

Paper Feeder in Operation.

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stantly stopped by means of a combined driving and tripping box which varies according to whether electrical or mechanical power is used. This tripping box is placed on the floor back of the press flywheel, and underneath the platform at the side of the press. Power is transmitted to feeder from press or motor through a knuckle-jointed shaft for either motor or belt-driven presses. All the parts for shifting the belt, applying the brake and tripping the impression are in this trip box and they are all controlled automatically by the sheet which is being fed. From our description it will be seen that the machine may stop feeding, the impression may be tripped, or the press stopped, depending on the nature of the difficulty. The adjustments can be made so accurately that even tissue paper can be fed with as much certainty of success as a heavy paper. At the Scribner Press, where our photographs of the feeding machines were taken, the finest three-color work is printed at a high rate of speed, with the aid of these feeders, and in four-color work they are particularly economical. These feeders are also very useful in binderies, the mechanism, of course, being slightly varied to allow of the difference between printing presses and folding or ruling machines. The paper-feeder is a machine which is not an invention, but a series of inventions.

Cupples Station—A Combined Freight Depot and Business Block.

BY EARL MAYO.

The genius for organization and for the economy which results from operating on the largest possible scale, have been remarked by observant foreign visitors as characteristic of Americans. This development has been carried much further toward perfection in the field of production than in that of distribution. There is, however, one institution in the United States in which the wholesale handling, distributing, and transshipment of goods has been worked out on a scale of elaborateness and with a perfection of detail unequalled by any similar institution in the world. This is Cupples Station.

The World's Fair in St. Louis next year will give an opportunity to wholesale merchants and organizations of business men to visit this unique establishment, which they will find of great instructive interest. It is in a measure a public institution, for, while founded as a private enterprise by Mr. Samuel Cupples and Mr. Robert S. Brookings, and developed by them into a very successful business, they gave it outright to Washington University in 1900, and it is now administered in the interests of the University. At the time of its transfer it was valued at \$3,000,000, which was considered a very conservative estimate.

Cupples Station is in brief a mammoth freight depot, a distributing station through which passes a large part of the business traffic between the Southwest and the rest of the country, and a clearing house for the wholesale trade of St. Louis and its tributary territory. It consists of a series of eight immense brick structures, seven stories in height, grouped close together, in which are housed some of the largest wholesale concerns and heaviest shippers in the country.

The advantages that its tenants enjoy from this concentration are those that come from the rapid and economical handling of freight and from practically the entire elimination of trucking.

The latter is a most important consideration. In nearly all other important transshipping points goods have to be carted twice. In New York, for example, all merchandise must be loaded and unloaded twice in entering and leaving the city, and nearly forty thousand trucks are employed in this work. By the system in operation at Cupples Station, nine-tenths of this carting is done away with.

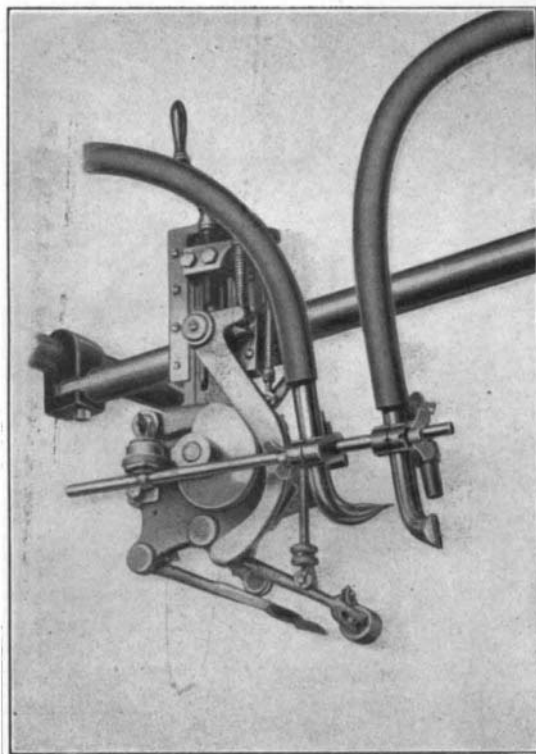
The conformation of the city and the arrangement of its terminal facilities are of material importance in making possible the operation of this plan. All the railways entering St. Louis are connected by what is known as the Terminal Railway, so that all the tracks over which freight is moved are brought together into one group.

Close beside these tracks are the buildings which constitute Cupples Station, with spurs and switches running underneath all of them. The loaded cars are run directly into the buildings; the freight is discharged at the platforms upon very heavy trucks capable of moving 4,000 pounds each; immense hydraulic lifts elevate it to the particular floor for which it is destined; from here it is wheeled to the storerooms of the firms to which it is consigned. Similarly, outgoing goods are loaded on the trucks at the shipper's door, and thence moved direct to the car. All cartage is done away with except on local business destined to other points in the city.

The saving in time, labor, and expense which this arrangement makes possible is evident from the mere statement of the facts. But the most noteworthy feature of the system, and the one on which its success chiefly depends, is the method by which the

shipping transactions of all the concerns in Cupples Station are co-ordinated, so that they are carried on practically as though they were the operations of a single organization.

All the loading, unloading, and handling of goods is done, not by the shippers and receivers, but by the employes of the station management. They unload the cars, move the trucks, and deliver the goods

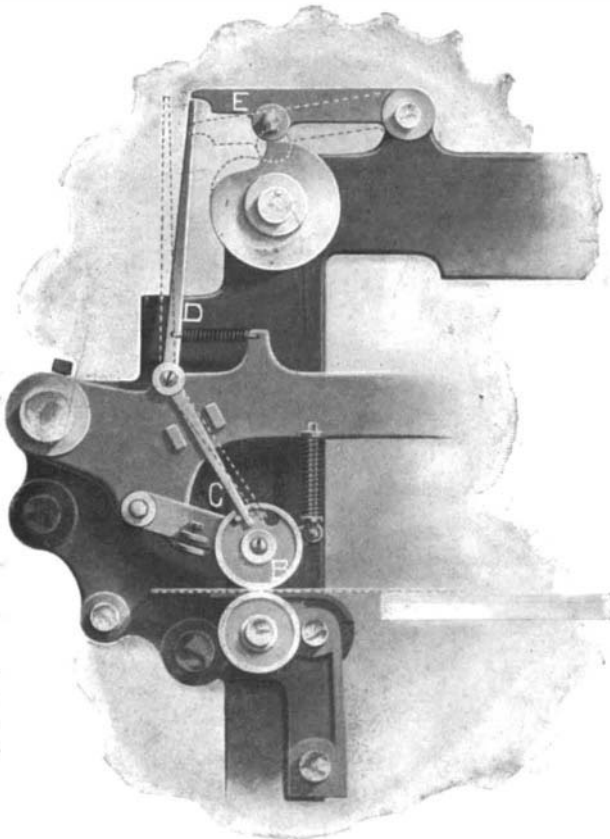


Buckler and Air Hose.

at the consignee's door. When a firm is shipping freight, it need only place it on the truck. It is moved to the cars and placed on board by the station employes, who also attend to the bills of lading and all such matters. The expense of this work is assessed *pro rata* on the different tenants according to the extent of their shipments.

This makes possible further economies in the loading and movement of cars. Cupples Station receives and ships about a thousand tons of merchandise a day, which, according to Dr. Taussig, president of the Terminal Association, is more than is handled by any railway freight station in the country. Notwithstanding the great volume of business, everything moves in the most systematic and orderly manner.

The cars containing inbound goods are delivered alongside the platforms during the night by the different railways. Early in the morning the work of unloading begins, and by nine o'clock in the morning



Detail of Paper Caliper.

AUTOMATIC PAPER-FEEDER FOR PRINTING MACHINERY.

most of the goods are delivered. As many as sixty cars have been unloaded within two hours, and the contents distributed to the various storerooms in which they belong.

The incoming goods being thus disposed of in the morning, the remainder of the day is devoted to the

handling of outbound freight. The loaded trucks are rolled out of the various stores on the upper or shipping truckways into the great freight-receiving room. Here the goods are received; bills of lading are made out; the packages are assorted for station order loading, and go out by trains over the various roads during the day. Each railway has a schedule hour for pulling its train, and the various firms assort their orders and get out their goods to conform as closely as possible to these schedules. One of the beauties of the system is that a single package of merchandise can be shipped from the doors of any of the offices to any point with equal facility as a carload lot, and without the delay, expense, and possibilities of damage that exist where cartage is necessary.

The station is a very beehive of activity during business hours, when its two thousand employes, its forty-eight immense hydraulic elevators, and its four thousand trucks are all in action. Cars are unloaded almost in less time than the telling takes, and their contents are whisked away to a dozen different destinations, all under one roof. The interior arrangements are planned with the greatest care, and space is used to the utmost possible advantage. The space is rented out in floors; and while the tenants are able to conduct their business at a saving over the expense they would be under in separate and scattered buildings, the station itself pays handsome dividends on the investments it represents.

The different buildings of the Cupples group occupy an area of over thirty acres, and include a floor space of a million and a half square feet. The thirty tenants represent an invested capital of more than \$25,000,000 and an annual business of over \$75,000,000. The vast interests represented increase the efficiency of the station's work, which depends for its success upon the handling of a large volume of business.

Cupples Station represents to its tenants convenience and facility in shipments, economies in labor, in the operation of elevators and trucks, economies through the elimination of the expense of drayage, through the saving of waste and damage to goods in handling, and it also represents a saving in the cost of light, heat, and steam, owing to the location on the premises of an immense electric-lighting and steam-heating plant operated by the company. The whole enterprise is the most complete development of a typically American idea.

Another Radium Phenomenon.

Prof. Curie has communicated to the French Physical Society still another remarkable property of radium. But a few months ago scientific men shook their heads when it was proclaimed that the new substance possessed the property of maintaining a temperature higher than that of the surrounding atmosphere. Prof. Curie now announces the amazing fact that the change in the rate of heat emission of radium within the comparatively short distance of absolute zero is exactly in the opposite direction to what might be expected in view of the effect of low temperatures on ordinary chemical action, for at the temperature of liquid hydrogen the heat emission of radium, instead of being reduced, is augmented.

In simple language, the substance which does not change its heat at all temperatures, from that of an ordinary room to that of liquid air, gives out a greater heat when subjected to the greatest cold that scientists have yet reached.

These experiments with liquid hydrogen have led to the curious discovery that freshly prepared salt or solution of radium has a comparatively feeble power of giving off heat at all temperatures, but the power steadily increases for about a month, when it reaches its maximum activity, which it then maintains apparently indefinitely. These remarkable results have failed to throw any light upon the process whereby radium maintains a constant emission of heat radio-activity.

Vesuvius in Eruption.

Dispatches published in the daily press from the Observatory of Vesuvius state that explosions have developed new fissures in the cone of the volcano's crater. Through these fissures lava is flowing in two streams, the smaller one to the southeast, and the other and more important to the north.

For many months the oil consumption of the world has exceeded the production, for which reason financiers and merchants have feared a possible exhaustion of the oil fields. Reports published in the Manual of Statistics, however, show an extensive decrease in the stock of crude petroleum in the greatest of all American fields, Pennsylvania, within the last two years and figures of equal authority indicate that for months the consumption of oil from Pennsylvania and West Virginia wells has been very largely in excess of production. The stock of crude Pennsylvania petroleum above ground in December, 1900, was 13,174,717 barrels, while in December, 1902, the amount thus stored was only 5,699,127 barrels.