

larly arranged. When the pin, *h*, is released by the escapement, *H*, the timing wheel will perform one-sixth of an entire revolution. In doing this, one of the points, *i*, interlock with the teeth, *j*, of the type wheel, causing it to be held firmly while still in motion; while another of the pins, *h*, act on a lever, *j'*, forcing the printing roller, *T*, carrying the paper ribbon, *r*, against the letter opposite it upon the type wheel, as it passes. The type are arranged around the wheel, *J*, so as to correspond with slots, *a*, in the composing cylinder, *B* (Fig. 3); and as the type wheel is geared by cog wheels, *W*, to the cylinder, so as to revolve in the same time with it, it is evident that, if the type wheel were set with any letter opposite the printing roller, *T*, at the same time the key of that letter entered its corresponding slot on the cylinder, *B*, the circuit would be closed at every revolution of the cylinder at the exact instant the letter was passing the roller, *T*, which would be forced against it in the manner before described. Any other key being pressed down would, in like manner, print its corresponding letter upon the strip of paper. Therefore, in order to communicate with any other station—say from New York to Boston—it is only necessary that the type wheel at that station should revolve *precisely* at the same rate as the composing cylinder at the transmitting station, which, being connected with it in the same manner by the electric current, would operate with the same effect as if it were a part of the same machine. This explains how all the different letters are printed at the station with one wire—an operation which, at first sight, is difficult to understand. This coincidence of motion is effected by a most ingenious governor, the invention of the American Telegraph Company's machinist—G. M. Phelps—consisting of a drum, *N* (Fig. 3), geared to the cylinder, *B*, and moving with it, but much faster. If this drum revolves too rapidly, the increased centrifugal force acting on a detached portion of the drum causes it to move a series of levers inside, raising a spring which closes the circuit of a local battery through the electro-magnet, *O*, and applies a brake, *p*, to the drum, instantly reducing the speed to its required limit. The speed of the governor is adjusted to correspond with other stations by a lever and screw, *s*. The "caller" or sounder, *D*, gives notice that a communication is to be sent. The roll, *K*, supplies the paper which is drawn forward by teeth, *k* (Fig. 4), on the type wheel, which interlock with similar ones on the roller, *T*, at the instant a letter is printed. The type are inked by the roller, *R*. The switch, *M*, conducts the current through the caller, *D*, or electro-magnet, *E*, as may be desired, by means of anvils, *m n*. The lever, *P*, stops the type wheel at the "space" when a communication is to be received, so that the person sending, by commencing with the space key, brings the instrument into correspondence as the type wheel is released by the first movement of the wheel, *I*. The lever, *L*, serves to throw the lever, *j'*, out of connection with the pins, *h h*, so as not to print when sending to other stations.

The "combination instrument" is the fastest and most accurate in the world. It produces a letter with only one electric wave; while the Morse instrument requires, on an average, three-and-a-half waves, and the House telegraph still more than this. Its ordinary rate of operation produces about 2,000 words per hour, and it can be worked much higher. It is believed, by old and experienced telegraphers, to be in advance of every other telegraphic instrument in the world.

In our next number, we shall give a description of the great telegraphic establishment belonging to the combined association, in this city. The patent of Professor Morse (lately extended for seven years) was for the method of operating local circuits by the main current; that of Professor House was for his instrument patented in 1846.

**SULPHURIC ACID FROM PYRITES.**—The *Revue Universelle* says that sulphuric acid is now manufactured in Harz from iron and copper pyrites. An apparatus was constructed at Ocker, in 1841, and proved so successful that the manufacture has been constantly extending ever since. The mineral used contains about 20 per cent of copper and 80 of iron pyrites, the sulphur constituting 50 per cent. The *Revue* has a full description of the process, with drawings of the apparatus, in the March number, to which we refer such of our readers as may desire to inquire further into the matter.

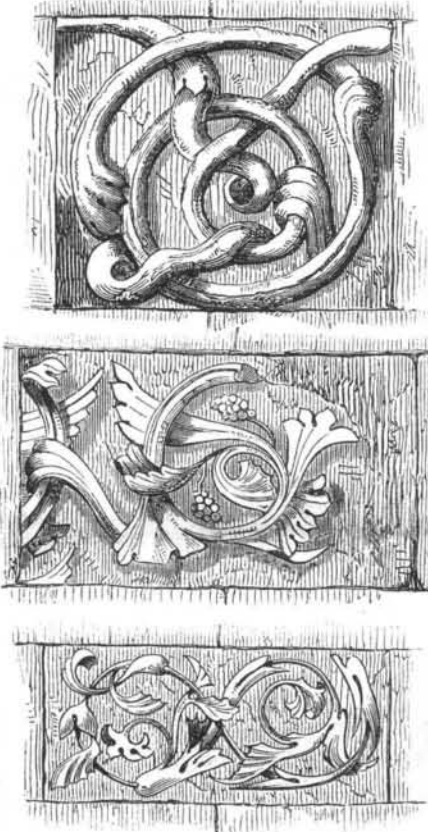
#### ARCHITECTURE IN THE HOLY LAND.

We extract the following letter, with engravings of the curious drawings, from the *London Builder*:—

The three sketches of sculptured stone on this page are from the inner court of the Latin Convent at Nazareth. They are built here and there into the modern stone wall, over and near to the archway which leads directly to the principal entrance to the celebrated Church of the Annunciation, without any regard to uniformity, but as merely to preserve them as relics of some former buildings.

If they tend to testify the early existence of Christian art in Nazareth, it will be interesting to see whether historic records throw any light on the period of their execution, for they seem to be of various styles and epochs.

We find that there were in Nazareth no Christian inhabitants till the time of Constantine, and no Christian pilgrimages to it till the sixth century.



In the seventh century we hear of two churches existing in Nazareth, one over the fountain where a Greek church now stands, and the other over the supposed house of Mary, called the church of the Annunciation.

After the capture of Jerusalem by the Crusaders, Tancred, who was made governor of the province of Galilee, built a church at Nazareth. In 1263, this church was laid in ruins by Sultan Bibars, and continued so for nearly four hundred years.

In 1291, Nazareth was taken by the Sultan Khalcel, when he stormed the neighboring city of St. Jean d'Acre. From this time, for a long period, Palestine was closed to Christian pilgrims and architects.

In 1620, however, the Franciscans obtained permission from the renowned Fakh-ed-Deen, to rebuild the church on the original site, and to take possession of the grotto of the Annunciation; from whence it is believed by the Latins that the house of the Virgin had been removed to Italy.

It is said that these Franciscans found among the ruins the fragments I have sketched here. Can they be relics of the church of Tancred, or of an earlier shrine upon this consecrated site?

There are other remains which bear the stamp of thirteenth century feeling, especially a curious cat-like monster, twining about grotesquely, with his hind leg over his head; it is carved on the key-stone of an arch, and is now introduced in the modern gateway leading from the outer to the inner court of the convent.

There are several old columns of red sienite near the church door, and a few carved capitals lying about.

From the time that the Franciscans began their work, under Fakh-ed-Deen's protection, when the present

church rose out of the ruins, the convent has been ever increasing in importance and wealth.

The church is about 70 feet square; the walls and piers are covered with canvas hangings, painted in imitation of tapestry; all the alabaster carvings and decorations, which really belong to the modern building, are, though very elaborate, bad in design, and executed without intelligence.

I tried to glean some information from the superior, but he was no archæologist; he, however, gave me every facility in my examination of the convent buildings, in the spring of the year 1858.

About a quarter of an hour's ride from the city of Jerusalem, in a rocky and lonely valley, stands the "Convent of the Cross," lately very thoroughly restored by the Greeks, to whom it now belongs. An excellent college has been established there for forty or fifty students.

It was formerly the property of the Georgians, and was founded by them, in the fifth century, on the very spot where grew the tree which furnished the wood of the cross. This, at least, is the tradition.

The building stood in ruins for a long period, but much of the ancient portion is still carefully preserved. The old church is about 70 feet long, and is divided into nave and aisles by four massive piers, supporting pointed arches and a groined roof. The walls are covered with curious and quaint frescoes, and the altar-screen contains a pictorial history of the sacred tree, from the time when it was planted by Abraham and Lot till it was hewn down and formed into a cross. In a dark, damp, rocky cavern, under the altar, an opening is shown as the identical spot of its growth.

As sculpture is strictly forbidden by Georgians and Greeks, all the decorations depend on color; but, in some of the pictures, the figures are cut out in thin wood, painted and mounted on appropriate backgrounds. The nimbus is generally of gold, and many stones and jewels are introduced in the adornment of the dresses.

Under the dome is a large square mosaic pavement, the finest I have met with in Palestine; quaint birds and curious figures and Christian symbols are represented, and in the lozenge-shaped spaces, left by the intersecting lines of the framework of these devices, beautiful designs are introduced. The tesserae of which this pavement is composed are about three-quarters of an inch square, and are black, white, red, blue, and yellow.

MARY ELIZA ROGERS,

#### BELTS FOR DRIVING MACHINERY.

MESSRS. EDITORS:—On page 150 of the present volume of the *SCIENTIFIC AMERICAN*, the above subject was discussed in a couple of interesting letters, the substance of both of which is very correct; but on page 197 another correspondent (writing from Dayton, Ohio) makes assertions which suggest some comments. He says there is room for difference of opinion (and I for one cheerfully grant it), and that his experience of over 20 years has taught him different facts. He states that he ran the smooth or hair side of a belt next to pulleys, but dropped it, because the strength of leather lies on the hair side and in one-fourth of the belt's thickness, and this, when worn out, makes the belt "not worth a straw." He then goes on to say: "I now use the rough or flesh side;" and then gives his method of treating them with dubbing, &c.

The wearing of belts depends altogether on circumstances. If they adhere well to the pulleys and there is no slipping, but a continued adhesion while at work, leaving the pulleys clear, there is no perceptible wear while running with the hair side to the pulley; but put the rough or flesh side to it, and the wearing of it will soon occur from friction caused by slipping on the pulleys. While speaking of the wearing of belts, I will give some of my experience, which has been constant for over 30 years; and during that time I have never yet had a belt to wear off in the hair surface, when the belt worked clear and adhered to the pulley as it should do. In confirmation of this, I will here state that we have now (and have had for the past 12 years) a driving belt 12 inches in width, running with the hair side next the pulley, at an angle of about 60 degrees. It has never given us any trouble during that time, and has only once been taken down for repairs of any kind. In this case some of the rivets were replaced, and it was then put to work immediately. Our machinery driven by it consists of 44 woolen looms and the necessary carding and spinning "fixings," requiring from 18 to 20 horse-power at the