history on the other side of the water. Our regret that English locomotive engineers should be deprived of these valuable records for use in their projected museum does not prevent us from expressing our satisfaction that the Field Museum, in Chicago, is proportionately enriched. The moral of the incident is that no time should be lost on either side of the water in gathering together the scattered remnants of drawings, records, etc., which are liable to be lost or destroyed or sold, through failure of the parties who own them to appreciate their intrinsic historical value.

THE JUDGMENT IN THE CORDITE CASE.

The celebrated cordite case, in which Mr. Hiram Maxim is suing the English government for infringement of his patent for the manufacture of smokeless powder, has been one of the sensations of the naval and military world, and calls to mind the celebrated Nobel case of a few years previous. Mr. Maxim, who is one of the most successful inventors and manufacturers in the field of guns and explosives, is the inventor of a smokeless powder which bears his name and is perhaps the most successful powder of its kind on the market to-day.

The English government is making and using a smokeless powder to which it has given the name of cordite. It closely resembles the Maxim powder, and so directly infringed some of the most important claims of his patent that the patentee carried the matter to the courts. The case has attracted unusual interest, both because of the great celebrity of the plaintiff and the many millions of dollars which were involved in the decision.

Nitro-glycerine, as every one knows, is much too violent to be employed in firearms. If a gun should be loaded with a charge of dynamite and be set off with a fulminating cap in the ordinary way, instead of propelling the shot at a high velocity, it would blow both the gun and the shot into atoms.

Guncotton, that is, tri-nitro-cellulose, is also a very violent explosive, but if it is dissolved in acetone and the residue dried, it may be employed in a gun when nearly in a dry state; that is, if it has about 2 per cent of acetone in the compound it holds its shape and may be used as a propellant in firearms, but it is apt to get too dry. When the last vestige of solvent escapes, it is very apt to crack, exfoliate, and become porous and scaly. In this condition it is too violent to use in a firearm. However, if a small portion of castor oil is mixed with the solvent, the solvent dries out and leaves the castor oil, and the guncotton may thus be advantageously employed in almost its pure state. Camphor acts in the same manner as castor oil, but camphor evaporates after a time, leaving the cellulose in its pure state, when it becomes dangerous.

Suppose now that a small quantity of nitro-glycerine, say 3 per cent or 4 per cent, is combined with the guncotton, it prevents it from getting too dry, and makes it burn very much slower; in fact, nitro-glycerine may be said to "slow the mixture" until about 10 per cent is added.

In 1888 Hiram S. Maxim combined high grade guncotton, that is, the insoluble variety of tri-nitro-cellulose, with nitro-glycerine to form an explosive, but as the tri-nitro-cellulose was not soluble in nitro-glycerine, it was dissolved in acetone. The acetone was then evaporated out, leaving the compound nitro-glycerine and true guncotton, and, to insure a greater degree of stability and uniformity in burning, various oils were experimented with. However, in the end castor oil was found, everything considered, to be preferable; so the next year another patent was taken out for a powder consisting of tri-nitro-cellulose, nitro-glycerine and a suitable oil.

The second claim of Mr. Maxim's patent is as follows: "The manufacture of an explosive compound by first dissolving guncotton by means of acetone or other solvent and then incorporating with the dissolved guncotton, nitro-glycerine or similar material and castor oil or other suitable oil substantially as hereinbefore described."

The English government had been using cylinder oil in place of castor oil, and to avoid the Maxim patent they called it "mineral jelly." Cylinder oil is the product of the same filtering process as is used in producing vaseline, and the government experts were obliged to admit in the trial that its utility for powder making is the same. One witness claimed that the cylinder oil was used, not to moderate the explosion, but to lubricate the bore of the gun. The same witness for the government had previously testified that the oil was used to prevent detonation — this testimony having been given in the Nobel trial.

The judge gave judgment against the plaintiff. The burden of the judgment was to the effect that the cylinder oil which the government used was not an oil but a hydrocarbon, or at any rate that it could not be considered under the head of a "suitable oil." It was also decided that the proportions used by the government were different from those of Mr. Maxim, consequently they did not infringe in that respect; and yet it was admitted that according to the first claim of the patent all proportions were included. It will be understood, of course, that the judgment was not against the validity of Mr. Maxim's patent. It decides that the patent is valid but that the government has not infringed.

THE HEAVENS FOR APRIL.

BY WILLIAM R. BROOKS, M.A., F.R.A.S.

The sun's right ascension on the first of the month is 0 h. 45 m. 0 s.; and its declination north of the celestial equator 4 deg. 50 m. 16 s.

On the last day of the month the sun's right ascension is 2 h. 32 m. 37 s.; and its declination north 15 deg. 0 m. 18 s.

Although we are now at the minimum period of the sun spot cycle, an occasional fine group may be seen. The great naked eye spot of January last, which was nearly 90,000 miles in length, appeared by rotation of the sun in February and March, in accordance with the prediction, and will probably be again seen well advanced on the sun's disk on the first of April. At each reappearance in February and March, the group had changed considerably in shape and was reduced in size, although visible to the naked eye through a smoked glass.

MERCURY.

Mercury on the first day of April, at 10 hours, is in superior conjunction with the sun, or exactly in a line with the earth and sun beyond the sun. Mercury then changes from morning to evening star. This little world, about 3,000 miles in diameter, moves so swiftly in its journey around the sun that, by April 28, it will reach its greatest elongation east of the sun, 20 deg. 43 m. This will be the best time to look for Mercury in the western evening sky, its northern declination being very favorable indeed. Another interesting fact, and one of great value in identifying this shy little planet, is that, at the time of its greatest elongation from the sun, it will be just eastward of the well known Pleiades.

On April 17, at 4 hours, Mercury and Venus will be in conjunction, when Mercury will be 5 deg. 13 m. south of Venus.

The right ascension of Mercury on April 1 is 0 h. 45 m. 0 s., and its declination north is 3 deg. 40 m. 40 s. On the last day of the month its right ascension is 3 h. 52 m. 59 s., and its declination north 22 deg. 59 m. 40 s.

VENUS.

Venus is still our lovely evening star, and will continue as such through nearly the entire month. On April 28, at one o'clock, it comes into inferior conjunction with the sun and then changes to morning star. Its northern declination will keep it a conspicuous object in the western evening sky during the early portion of the month. All should attempt to secure a telescopic view of Venus during the first week or two of April, for, seen in the telescope, it presents a most beautiful crescent phase, resembling the new moon two or three days old. The apparent diameter of the cusps will increase, while the crescent will become more slender until inferior conjunction.

The conjunction of Venus with Mercury on April 17 has been referred to in the section on Mercury.

On April 4, at 6 h. 52 m., Venus will be in conjunction with the moon, when Venus will be 1 deg. 35 m. north of the moon. Venus is stationary on April 6, which means that its motion is in the line of sight, and in this case, toward the earth.

On the 1st of the month Venus crosses the meridian at 2 h. 6 m. in the afternoon, and sets at half past nine in the evening.

On the last of the month, being near to inferior conjunction, Venus crosses the meridian and sets almost simultaneously with the sun.

The right ascension of Venus on April 15 is 2 h. 43 m. 47 s., and its declination north 22 deg. 53 m. 28 s.

MARS.

Mars is evening star, being somewhat west of overhead at early evening and in the constellation Gemini the Twins.

On April 8, at nine o'clock in the morning, there will be a very interesting conjunction of Mars and the third magnitude star Epsilon Geminorum, when Mars will be only two minutes of arc south of the star.

The nearest approach, occurring as it does in full daylight, will only be observable in the telescope. But on the evening of April 7, before the conjunction, and on the evening of the 8th, after the conjunction, the star and planet will be seen very close together. Their change of position will also afford an interesting illustration of the planet's orbital motion.

On April 9, at 3 h. 52 m., Mars is in conjunction with the moon, when the planet will be 50 m. of arc south of the moon.

On April 16, at 8 h., Mars reaches its greatest heliocentric latitude north.

On the first of the month Mars crosses the meridian at 5 h. 41 m. in the afternoon, and sets 1 h. 20 m. after midnight. On the last of the month Mars crosses the meridian at 4 h. 47 m. and sets 20 m. after midnight.

JUPITER.

Jupiter is well up in the eastern evening sky as soon as it is dusk. It is in Leo, a few degrees east of the bright star Regulus, where it will remain apparently almost stationary among the stars during the latter part of the month. Jupiter is splendidly placed now for telescopic observation during a large part of the night. The structure of its wonderful belt system is exceedingly interesting, showing much complicated detail. The phenomena of its satellites will also prove of great interest. Some instances here follow.

On the evening of April 4, at 8 h. 38 m., satellite I will enter upon the disk of Jupiter in transit. At 9 h. 31 m. the shadow of satellite I will enter in transit. At 10 h. 57 m. the egress of satellite I will occur; and at 11 h. 50 m. the shadow of satellite I will pass off the disk. On April 6, at 8 h. 5 m., satellite III will enter upon the disk of the planet in transit. At 11 h. 39 m. the satellite will leave the disk; and at 11 h. 48 m. the shadow will egress. On April 16, at 7 h. 55 m., the shadow of satellite II will enter upon the disk. At 8 h. 40 m. satellite II will pass off the disk. At 9 h. 22 m. satellite IV will reappear from an occultation. At 10 h. 46 m. the shadow of satellite II will pass off the disk. On April 13 at 5 h. 56 m. Jupiter is in conjunction with the moon, when the planet will be 3 deg. 8 m. north of the moon. On April 1 Jupiter crosses the meridian at 9 h. 32 m. P. M. and sets at 4 h. 20 m. A. M. On the last of the month it crosses the meridian at 7 h. 34 m. P. M. and sets at 2 h. 15 m. A. M.

The right ascension of Jupiter at the middle of the month is 10 h. 11 m. 39 s.; and its declination north 12 deg. 32 m. 38 s.

SATURN.

Saturn is morning star, rising, however, at 10 h. 20 m. P. M. at the opening of the month; very good observations may be had with the telescope after midnight. On the first of the month it is on the meridian at 3 h. 11 m. A. M. The right ascension of Saturn on the fifteenth of the month is 15 h. 51 m. 51 s.; declination south 17 deg. 52 m. 26 s.

URANUS AND NEPTUNE.

Uranus is in Scorpio near its northwestern border. Its right ascension for the middle of the month is 15 h. 44 m. 15 s.; and its declination south 19 deg. 33 m. 17 s. Neptune is between the horns of Taurus. Its position for the middle of the month being, right ascension, 5 h. 8 m. 54 s.; declination north, 21 deg. 34 m. 25 s.

Smith Observatory, Geneva, N. Y., March 18, 1897.

MAGNETIC METAL EXTRACTION.

Magnetic extraction of metals from ores is successfully practiced at the Franklin Furnace, New Jersey, in the Edison plant operating there. The method is described thus: There are three sets of the magnets, 74 in the first set, 320 in the second, and 320 in the third set. The magnets are about four feet long, and the ore on its journeyings has to pass a mile of faces of magnets. Right here is presented what to the layman is a most remarkable feature of the process. The magnets are arranged in tiers of five in a tier. The top one is weak, but they increase in strength as they go down, until the bottom one is very powerful. The ground rock passes through the screen and starts downward in front of the magnets. The magnets jerk the particles of iron oxide from the mass as they descend; but the iron does not adhere to the magnets. And right here is a most surprising sight. The ore, in passing the first magnet, inclines toward it. As it rushes down, the ore swings in more toward the magnets, until as it reaches the last one it curves inward and under it in a half circle, without any particle of ore adhering to the magnet. In the first passage past the magnets small quantities of stone stick to the ore. The ore is carried upward and started down before the second lot of magnets after passing through a mill which grinds off the particles of stone. The first set of magnets extract 62 per cent of oxide of iron. When the mass has passed the second set of magnets, there is in it 75 per cent of oxide of iron. Then it is ground again and passes the third and most powerful set of magnets, which takes the phosphates out and makes Bessemer of it. The percentage of iron oxide is then from 85 to 87.

[McCaul's Factory, from which the above is taken, fails to state how much coal and how many horse power is required to crush a ton of the ore and operate all the magnets used in the separation. The SCIENTIFIC AMERICAN readers would like to know.—Ed.]

RAPID BRIDGE ERECTION.

We have recently had occasion to make note of instances of rapid bridge erection, and we are now in receipt of a letter from Mr. W. F. Chapman, of Montreal, Canada, giving us the latest and in some respects the most remarkable case of this kind on record. We are informed that at Vandreuil, Quebec, a place about twenty-five miles from Montreal, the Grand Trunk Railway Company recently took out a 98 foot iron span in the brief period of eight minutes, and erected a new one in its place in forty-seven minutes. The whole operation, including preliminary preparations, occupying only three hours. The weight of the bridge is not given, but the performance was, in any case, very remarkable, and we agree with the writer that it was probably unprecedented.