

age horse can do for eight hours per day. The 33,000 foot-pounds per minute is derived from the above in the following manner. The horse moves at the rate of  $2\frac{1}{2}$  miles or 13,000 feet per hour or 220 ft. per minute. Then it is presumed that the same force will raise 220 times 150 pounds (33,000 pounds) one foot in the same time.

This is therefore the amount which Watt considered equivalent to a horse power, and is the rule used in America and Britain in rating the actual power of engines as follows: If the number of square inches in the piston of a steam-engine be 100, and the pressure of steam 100 pounds on each square inch, the total force of the engine is 10,000 pounds (100x100). Next find the distance through which this force is exerted. If the stroke is two feet, the force will be exerted at four feet (two strokes) to each revolution, and if the engine makes 25 revolutions per minute, that force is exerted through 100 feet (25x4) in one minute. The next thing is to find what force acting through one foot per minute is equal to 10,000 pounds through 100 feet, which is 100x10,000 or 1,000,000 pounds. This number of pounds moved one foot per minute is equal to the power of the engine, and 33,000 pounds as above is equal to the power of an average horse. Hence dividing 1,000,000 by 33,000 and we get  $33\frac{1}{3}$  horse power.

At a greater speed than  $2\frac{1}{2}$  miles per hour the power of a horse diminishes rapidly, and when he reaches his maximum speed all his power is exerted in moving his own weight, a very important matter for owners and drivers of horses to bear in mind. It is estimated that the draught of a horse at 12 miles per hour is only twenty pounds or seven and one half times less than at the rate of  $2\frac{1}{2}$  miles as above. Hence if engines of 1000 horse power propel a steam boat at the rate of 12 miles per hour, it would not be correct to infer that 1000 horses could draw it at the same speed, because at that rate a horse can only exert a pull of 20 pounds, therefore it would require a team of 7,500 horses (1000x7 $\frac{1}{2}$ ) to obtain the same speed; this shows the vast advantage of steam over every other known motive power in its compactness and portability; with suitable tread mills on the boat, so arranged that the horses might move at the rate of  $2\frac{1}{2}$  miles per hour, 1000 horses could perform the same work as the engines, but the horses would weigh some five or six hundred tons, consequently the greater part of their power would still be expended in moving their own weight. Thus the term "horse power" means the amount of power which will raise 33,000 pounds one foot in one minute or its equivalent, not the number of horses which could do the same work that an engine may do. If any one thinks the term horse power represents the actual number of horses that could do the same work, let him calculate how many horses it would require to draw a train of cars which a locomotive of 300 horse power draws at the rate of 15 miles an hour, and then let him find the horses which can make this time.—Condensed from *Manufacturer and Builder*.

The half-yearly examination of the cadets at the Royal Military Academy, Woolwich, together with the distribution by His Royal Highness the Duke of Cambridge, of the prizes and commissions in the Royal Engineers and Royal Artillery, is fixed for Friday first, 16th instant. The Academy will then close for the Christmas vacation, and the cadets be granted leave of absence for probably six weeks.

## OCEAN CABLES.

The following is a list of the ocean cables at present in operation:

CABLES.	LENGTH OF CABLE IN STATUTE MILES.
Dover to Calais.....	27
Denmark, across the Belt.....	18
Dover to Ostend.....	81
Frith of Forth.....	6
Port Patrick to Donaghadee.....	25
Port Patrick to Whitehead.....	27
Sweedon to Denmark.....	12
Italy to Corsica.....	110
Corsica to Sardinia.....	10
Egypt.....	10
Italy to Sicily.....	5
Newfoundland to Cape Breton.....	85
P.E. Island to N. Brunswick.....	12
Norway, across fiords.....	49
Across mouth of Danube.....	3
Ceylon to mainland of India.....	30
Italy to Sicily.....	8
England to Holland.....	140
England to Hanover.....	280
Norway, across fiords.....	16
S. Australia to King's Island.....	140
Ceylon to India.....	30
England to Denmark.....	368
Sweedon to Gotland.....	64
Folkestone to Boulogne.....	29
Malta to Sicily.....	60
England to Isle of Man.....	36
Suez to Jubal Island.....	220
Jersey to Prou, France.....	21
Tasmania to Bass Straits.....	240
Denmark (Great Belt).....	28
Dacca to Pegu.....	116
Barcelona to Mahon.....	180
Minorca to Majorca.....	35
Iviza to Majorca.....	74
St. Antonio to Iviza.....	76
Norway, across fiords.....	16
Toulon to Corsica.....	195
Holyhead to Howth, Ireland.....	64
Malta to Alexandria, via Tripoli and Benghazi.....	1,535
Newhaven to Dieppe.....	80
Pembroke to Wexford.....	63
Frith of Forth.....	6
England to Holland.....	130
Sardinia to Sicily.....	243
Persian Gulf.....	1,450
Otranto to Avlona.....	60
La Cole to Biserte.....	91
Sweedon to Prussia.....	55
Biserte to Marsala.....	165
Valentia to Heart's Content.....	2,160
Valentia to Heart's Content.....	1,214
Newfoundland to Cape Breton.....	94
Lowestoft to Nordenf.....	256
Placentia to Sydney, C.B.....	373
Dover to Lapanne.....	57
Cuba to Florida.....	333
Malta to Alexandria, direct.....	1,040
Cuba to Key West.....	140
Brest to St. Pierre.....	3,014
St. Pierre to Duxbury.....	873
Falmouth to Brest.....	336
From Bombay to Aden.....	2,381
Aden to Suez.....	1,419
Total.....	22,007

REGIMENTAL PIONEERS.—It has been decided, says the *Army and Navy Gazette* that the Pioneer Force of the Infantry Corps shall in future be composed of skilled artificers, selected as follows:—One non-commissioned officer (a carpenter by trade), three carpenters, two bricklayers, one smith (able to shoe horses), one mason (able to cut stone), one painter and glazier, two plumbers and gasfitters. The men are to undergo an examination as to their qualifications—"skil-

led," "ordinary," or "superior"—by the Royal Engineer Department, and, where necessary, are to be sent to Woolwich for instruction. They are not to be required to perform fatigue duties or to serve in the Quartermaster store, being considered as the regimental artificers.

The School established at Woolwich for the instruction of officers belonging to the Reserve Forces has been suspended until the 1st of February next, two classes having passed since its formation on the 1st of Oct. Those officers who remained during November as well as October, received the lodging allowance for both months, a fact which will probably encourage other officers to arrange for two months' study. The regulations provide that examinations of Volunteer corps may be made by officers of the Royal Artillery at headquarters instead of at the School, and on Wednesday last, Colonel Milman, R.A., examined and passed four officers of the 9th Kent Artillery at Plumstead, leaving two officers of that corps yet to be examined. All the sergeants passed, and every man of the establishment, together with fifty supernumeraries, were declared efficient, the inspecting officer pronouncing the 9th Kent a model corps.

Practical instruction for both officers and men is now the order of the day at our great camp at Aldershot. Last week, a divisional order issued on Monday, directs that classes are to be opened for the instruction of cavalry officers in field sketching, on Tuesdays and Thursdays at 2.30 p.m. The course commenced yesterday week. The officers of the 3rd Dragoon Guards and 9th Lancers are being instructed by Captain Hutehinson, Royal Artillery, Garrison Instructor, in the Survey Office, Q. Lines, South Camp; and the officers of the 12th Lancers are instructed by Captain Robinson, Rifle Brigade, Garrison Instructor, in the Lecture Room, Cavalry Barracks. In the promulgation of the order for the course of instruction to commence, it was stated that the Lieutenant-General commanding the Division trusted that as many cavalry officers as possible would avail themselves of the opportunity of acquiring some knowledge of a most important part of their duties.

DIAMONDS AND DIAMOND-CUTTING.—The cutting of diamonds is a modern art. It is supposed that Louis Van Berghem, or Berguem, was the first discoverer of cutting and polishing diamonds by their own power, in 1456 although some rude attempts were made a hundred years before. He pursued the calling in Bruges, and established a guild of diamond-cutters. His pupils, however, left Bruges on account of the intolerance of the priests, and established themselves in Amsterdam. Cardinal Mazarin patronized this industry greatly he caused the diamonds in the French crown to be recut, and they obtained thence the name of twelve Mazarins. His example caused a taste for jewels to prevail all classes. At this period Paris possessed seventy-five diamond-cutters, who were well employed. Later, however, the trade declined, and from that time diverted to Amsterdam, where several thousand persons, mostly of the Jewish religion, are now occupied as diamond-cutters. The largest mills are those of Mr. Coster, who employs from 500 to 600 men. By the way, there is a method by which a spurious diamond may be detected even by the unskilful. A set diamond may be tested by placing wax on its back. The lustre of a true gem will not be affected by this operation, while the spurious brilliancy of pasteimitation will be totally destroyed by it.—*American Artizan*.