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A STUDY OF BLOODLINES WHICH HAVE
PRODUCED 2:10 TROTTERS

by

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I INTRODUCTION

The first horses imported to America were undoubtedly of Thoroughbred origin. Although, the Thoroughbred, in England, was used primarily for racing, his use in this country was that of an all-purpose horse. Since the only means of travel, at that time, was by horse, the Thoroughbred was called upon to cover long distances. Horses possessing the greatest speed and stamina were naturally the most desirable for this purpose. The practice of using fast horses for traveling together with the English custom of racing led to the idea of racing as a pastime.

As the United States became better developed, men of leisure became interested in horse-racing. The Thoroughbred was first used in running races. With the invention and development of lighter types of vehicles, it was found that the Thoroughbred could make nearly as fast time in harness as under saddle. This form of racing was more facinating and, doubtless in some degree accounts for the origin of American Trotters. The first trotting races in harness were for distances varying from one-half mile to twenty miles. Later, however, a standard distance of one mile was established.

Early trotting records date back to the early part of the nineteenth century. On August 25, 1810, a

horse from Boston is reported to have trotted a mile, in harness, in 2:48 $\frac{1}{2}$. In 1818, Boston Blue made an authentic mile in 3:00. Twenty-seven years later the first 2:30 authentic record was established for one mile. On October 15, 1845, Lady Suffolk trotted a mile in 2:29 $\frac{1}{2}$. Jay-Eye-See, in 1884, was the first horse to trot a mile in 2:10. The present world's trotting record of 1:58, was made by Uhlan in 1912.

Many factors have been influential in the establishing of the foregoing records. The number of trotting horses is rapidly increasing. The early flat race tracks have been replaced by scientifically constructed courses. Great emphasis has been laid upon methods of shoeing, training and rigging. The replacement of the high-wheeled vehicle by the pneumatic-tired sulky has reduced the trotting record by at least five seconds. All of these have had their effect, but the fundamental factor in the lowering of records has been in careful breeding and in the selection of individuals possessing the desired type and characteristics.

Because of the importance of breeding in the production of trotting horses, interest centers in the families which have become known for their ability as fast trotters. Somewhat fragmentary and disconnected information on this subject can be had from observation of racing results from

year to year. Such information at best can not be carefully organized with the entire list of registered performers as a basis. The importance and value of information concerning the bloodlines which produce speed together with the dearth of summarized accurate data on the subject led to this work.

The data reported in this thesis are the results of a study of the bloodlines which have been most prominent in the production of individuals of extreme speed. As a basis for this extreme speed, those individuals were used which made trotting records of 2:10 or better, during the years 1911-1915, inclusive.

II. SKETCH OF THE AMERICAN TROTting HORSE¹

There has been developed, largely from a Thoroughbred foundation, a breed of horses peculiar to the United States, known as the American Trotter or Standard Bred Trotting horse. So diverse is the foundation stock of this standard bred horse that as yet no concise statement of his origin has been attempted. Fortunately, the history of the origin of the American Trotter is known, and this is given herewith.

The foreign horse that played the most important part in originating the American trotting breed, and that figures in the ancestry of our greatest sires and performers, was the Thoroughbred, Messenger, imported in 1788. Ever since trotting speed first began to be considered a mark of merit in the American horse, ever since trotting blood was talked of, the blood of this horse, Messenger, has been unanimously considered the chief foundation upon which the great trotting families have been developed.

But Imported Messenger was not the only source of distinctive trotting qualities. Breeders of Norfolk County, England, had long prized good driving horses and from thence came Imported Bellfounder, thirty-four years after the landing of Messenger. Abdallah, a stallion

1. Amer. Breeders Mag., 3(1912) No.1, pp.45-51.
Plumb, Types and Breeds of Livestock, Chapt.IV, pp.36-44.
Amer.Trotting Register, Vols.I-V.

61.3
21 | 1287
 126
 7
 7
 21
 60

strong in the blood of Messenger bred to a daughter of Bellfounder, the Charles Kent mare, produced Hambletonian 10, known as Rysdyk's Hambletonian, the first great sire of trotting speed and a progenitor of the large majority of living trotters.

Notwithstanding the prominence of these two sires in trotting history, due credit must be given other horses who were also famous as founders of trotting families. A brief description is here given of each family, as generally known, and its founder, so as to make the history complete.

On May 15, 1849, the Charles Kent Mare, a daughter of Imported Bellfounder gave birth to a male foal from the service of Abdallah, the grandson of Messenger. This colt was named Hambletonian 10, although frequently referred to as Rysdyk's Hambletonian. This horse is mentioned in a previous paragraph, but because of his importance as the founder of the most famous American family of trotters, repetition is made. To Hambletonian 10 are traced many of the most illustrious trotters of history. He was in stud service for twenty-one years, and during this time sired 1287 foals. Among the most famous sons and daughters of Hambletonian are Abdallah 15, Aberdeen 27, Dexter, Electioneer 125, George Wilkes 519, Happy Medium 400, Harold 413, Strathmore 408, Volunteer 55, Nettie 2:18, Orange Girl 2:20, Gazelle 2:21, Jay Gould 2:21½ and

Bella 2:22. The first ten of these proved very prepotent sires, and thus demonstrated the value of their remarkable sire.

The Mambrino family is named from Mambrino Chief 11, foaled in 1844 in Dutchess County, New York. Mambrino Chief was sired by Mambrino Paymaster and he by Mambrino, the Thoroughbred son of Imported Messenger. His dam is unknown. Mambrino Chief was taken to Kentucky in 1854, where he went into active stud service and passed the rest of his days. His most famous son, Mambrino Patchen 58, sired scores of trotters, while his daughter, Dolly, was the dam of Onward 1411, Director 1989 and Thorndale 305, a remarkable trio of sires.

One of the oldest trotting families is the Morgan, which inherits its name from a stallion named Justin Morgan, said to have been foaled in 1793, at West Springfield, Massachusetts. From this place he was taken to Vermont, in which state this family of horses has gained distinction. The breeding of Justin Morgan is more or less questioned, although it is said that both the sire and dam of Justin Morgan trace to the Godolphin Barb. Justin Morgan had a long stud career, but he did not produce great breeding sons to the same degree as did Hambletonian 10. Three of his sons, Bulrush, Woodbury and Sherman Morgan, were his greatest offspring. A son of Sherman Morgan, named Black Hawk 5, foaled in 1833, was a trotter and a productive sire,

and fourteen of his sons became recognized trotters. Ethan Allen, his greatest son, became very famous and popular as a successful trotter, and he proved to be a great sire. Among the thirty-six producing sons and daughters of Ethan Allen no one obtained such distinction as did Daniel Lambert, himself the sire of thirty-eight trotters. The sire of the dam of Daniel Lambert was Abdallah, the sire of Hambletonian 10. Later years have shown that the Hambletonian and Morgan families could be bred together to a very great advantage.

In 1820 a stallion, foaled in 1816 was imported from Tripoli. He was regarded as possessing great beauty, action and speed. He was used in the stud near Philadelphia and here sired Young Bashaw out of a granddaughter of Imported Messenger. Young Bashaw sired Andrew Jackson, the fastest trotter of his day. The trotting mare Lady Surrey, brought from Canada and owned by George M. Patchen, was bred to Andrew Jackson, from which mating she dropped a foal, named Henry Clay, in 1837, the sire for whom the Clay family is named. Henry Clay sired Black Douglas and Cassins M. Clay, the latter celebrated in his day as the sire of George M. Patchen who in 1860 trotted a mile in two minutes and twenty-three and a half seconds, thus being the first stallion to lower the trotting record of two minutes and twenty-five seconds for a mile. He later became a distinguished sire, sixteen of his sons having standard records (2:30 or better trotting or 2:25 or better pacing) and thirty-five of his

daughters being either dams of trotters or pacers.

In 1828, in the province of Quebec, was foaled a dark brown horse named Canadian Pilot, also commonly known as Old Pacing Pilot, from whence came the Pilot family. His sire is unknown and his dam was Jeanne d'Arc by Voyager, a Thoroughbred. When eighteen months old he was taken to Connecticut, and in 1830 to New York. In 1831 he was sold to go to New Orleans, but in 1832 he was returned to Kentucky, where he died in 1853. Canadian Pilot was not only a pacer but would also trot. His greatest son was Pilot Jr.¹², a gray horse, foaled in 1844, out of Nancy Pope by Funk's Havoc, a Thoroughbred. Pilot Jr. was a very successful sire of brood mares. Bred to Sally Russell, a daughter of the Thoroughbred horse, Boston, he sired Miss Russell one of the greatest American trotting brood mares. She was the dam of Maud S. 2:08 $\frac{1}{2}$, the first mare, as well as the first trotter, to trot a mile in less than 2:10. Another daughter, Midnight, out of a daughter of Lexington, a Thoroughbred, was the dam of Jay-Eye-See, the first horse to trot a mile in 2:10. The family history of Old Pacing Pilot is more or less obscure. He sired both pacers and trotters and rendered valuable service to the American trotting horse interests.

About 1828 there was brought to Kentucky a roan saddle horse, bred in Canada, known as Tom Hal. It is said that he was much abused in his time by a person

addicted to the use of liquor. He was first placed in the stud near Lexington, but later was removed to Harrison County, Kentucky. Tom Hal's ancestry is somewhat obscure, but it is thought he possessed some Morgan blood. Tom Hal obtained family fame as the sire of Gibson's Tom Hal, the sire of Hal Pointer 2:04 $\frac{1}{2}$, Little Brown Jug 2:11 $\frac{1}{4}$ and Brown Hal 2:12 $\frac{1}{2}$. The latter was the sire of Star Pointer, a pacer of marvelous speed, character and endurance who reduced the pacing record to 1:59 $\frac{1}{4}$. Brown Hal is the sire of about ninety performers in the 2:30 list, including Hal Dillard 2:04 $\frac{3}{4}$, Hal Chaffin 2:05 $\frac{1}{4}$, Elastic Pointer 2:06 $\frac{1}{2}$, Star Hal 2:06 $\frac{1}{4}$ and Braden 2:07 $\frac{1}{4}$. This is the most distinguished family embracing a large percentage of pacing blood.

By summarizing the families it will be noted that the blood of Imported Messenger, although outstanding in the Hambletonian and Mambrino families, is also present in the Clay and Morgan families. The Hal and Pilot families, as far as is known, do not possess any blood of Imported Messenger. The source of the blood of Imported Bellfounder is present in only one family, the Hambletonian. Since ninety or more per cent of all trotters owe their existence to the Hambletonian family, it has been said that Imported Messenger is the foundation horse of the American Trotting Breed.¹

1. Frank E. Best, Registrar of the American Trotting Register Association.

III. THE USUAL METHODS EMPLOYED IN CLASSIFYING TROTTERS AS TO FAMILIES AND BLOODLINES

In nearly all classes and breeds of livestock there occur family names which have been established by famous progenitors, either male or female. This is true of the American trotting horses. But unlike some of the breeds of livestock, the family names of American trotting horses are derived only from famous sires. There have been many famous sires of trotters, and without exception, these are called family founders- the family bearing the name of the sire.

If the origin of American trotting horses is studied, there will be observed what are known as the foundation families. These are: The Hambletonian, The Mambrino, The Clay, The Morgan, The Pilot, and The Hal families. The pedigrees of all registered trotting horses, past and present, contain the names of one or more of these families.

It was not until 1886, that any attempt was made at a classification of trotters as to families or blood-¹lines. In 1886, J. H. Wallace prepared two tables of sires which he grouped as to families. The first table included all sires having three or more new standard performers for 1886. A standard performer is any horse

1. Wallace's Yearbook, Vol. 2.

that has made a record of 2:30 or better trotting or 2:25 or better pacing and that has been duly registered in Wallace's American Trotting Register. These sires when grouped as to families appeared as follows:

<u>Family</u>	<u>Performers</u>
Hambletonian 10 { 9 sons sired - - - - -	39
{ 3 grandsons sired - - - - -	10
Mambrino Chief - 1 grandson sired - - - - -	7
Clay, Norman and Pacing families- 3 sires have 10	

The second table included all sires having ten or more standard performers up to and including 1886. When these were grouped the following families appeared:

<u>Family</u>	<u>Performers</u>
Hambletonian 10 { Sired - - - - -	40
{ 11 sons sired - - - - -	206
{ 4 grandsons sired - - -	73
{ 1 great-grandson sired -	10
Mambrino Chief { 2 sons sired - - - - -	25
{ 1 grandson sired + + - -	10
Ethan Allen - 1 son sired - - - - -	28
Six other sires got - - - - -	109

At the end of each year from this date, a table of sires and performers under their families, similar to the foregoing has been made. Each year witnessed the entry of a great number of performers into the standard list. Sires

other than the original family founders have established breeding records which have made them worthy of family names. The exact conditions necessary for the establishment of a family name is not defined. The Horse World¹ has the following to say about families. "It is safe to say that no sire that lived to make a few seasons in the stud can be said to have established a family unless at least ten of his sons become sires of standard speed. It is, too, true that some sires with ten speed-producing sons are no longer regarded as family founders, but a table showing just how many are represented by ten sons in the list of speed sires surely presents some interesting figures." The table is not presented herewith, but it included 165 sires having ten or more speed-producing sons. Of this total of 165 speed-producing sires, there were only six sires which had 100 or more speed-producing sons, and the names of these follow:

1. Horse World, 50 (1914) No.11, p.199.

Sires Having 100 or More
Speed-Producing Sons

No.	Sire	Sons
1	Onward 11	176
2	Hambletonian 10	150
3	Nutwood 600	150
4	Red Wilkes 1749	149
5	Electioneer 125	104
6	George Wilkes 519	103

It will be noted in this connection that George Wilkes 519, generally recognized as the greatest sire of trotters, ranks the lowest among the six leading sires having 100 or more speed-producing sons. But it should be further noted that Onward 1411 and Red Wilkes 1749, who are represented with 176 and 149 speed-producing sons, respectively, are sons of George Wilkes 519.

Fifteen sires of this list of 165 had fifty or more speed-producing sons. These fifteen sires and the six sires with 100 or more speed-producing sons make up the leading families and branches of families recognized today. Some of the more important families and their
1
number of branches follow:

1. Horse World, 50 (1914) No. 4, p. 51.

No.	Family	Number of Branches
1	Wilkes	34
2	Electioneer	25
3	Belmont	8
4	Dictator	4
5	Happy Medium	4
6	Woodford Mambrino	4
7	Strathmore	4
8	Almont	4
9	Harold	3
10	Edward Everett	2
11	Mambrino Patchen	2
12	Pilot Jr.	2
13	Volunteer	2
14	Robert McGregor	2
15	Tom Hal	1
16	Mambrino Pilot	1
17	Artillery	1
18	Clark Chief	1

In this table are represented eighteen families; nine of these have as their founder, sons of Hambletonian 10; three families have as their founder, grandsons of

Hambletonian 10. Thus Hambletonian 10 is the direct progenitor of twelve of the leading recognized families. Four families are represented by sons of Mambrino Chief, and the remaining two are by Pilot Jr. and Tom Hal (Gibson's), the greatest sons of the foundation families bearing these names.

Horsemen, in their classification of trotters as to families or bloodlines, take into consideration only the breeding of the sire of the individual in question. The breeding of the dam is not considered when the family to which a horse belongs is discussed. Furthermore, it is the "top sire", in the pedigree, that is considered. The term "top sire" refers to the sire, grand-sire, great-grand sire, etc., which always appear, in an extended pedigree, at the top of each generation of ancestors of an individual. For instance, Peter Scott 2:05 $\frac{1}{4}$ was sired by Peter the Great 2:07 $\frac{1}{4}$, he by Pilot Medium 1597 who is by Happy Medium 400. Thus Peter Scott 2:05 $\frac{1}{4}$ according to the recognized classification as to families, belongs to the Happy Medium family. The logic and correctness of this classification of individuals as to families will not be discussed here. It is shown in order to present general usage and custom.

IV. CONSIDERATION OF DATA

There is only one method of studying bloodlines of 2:10 trotters, namely, by pedigree. A pedigree is defined as the record of the lineage or ancestry of an individual.

¹
"The study of pedigree is an effort to understand, through an examination of its various sources the nature of the accumulated hereditary material. The further back we can trace the course of its flow and the more exhaustive our scrutiny of the various tributaries or sources of supply, the more dependable and complete is our information. A long line of ancestors with records of having produced the minimum of inferiority and of having continued to produce uniformly in accordance with their own records is the strongest possible and only conclusive proof that the hereditary material has been fully purged from all impurities by careful selection exercised by the breeders of those former generations in their elimination of all ancestors exhibiting or producing undesirable qualities."

²
"No observant, experienced stock breeder will deny that attention to pedigree is the touchstone to

1. Marshall, Breeding Farm Animals, p. 101.

2. Editorial, Breeders Gazette, 4 (1883) No.24, p.807.

success in livestock improvement; but a pedigree may be a good one or bad. If an animal belongs strictly to any one of the various well-established breeds, it is safe to assume that it will reproduce the general characteristics of the breed to which it belongs, unless paired with another of an equally well-established but different breed. But there is such a thing as inheritance- a well defined inheritance- of inferiority, running back through many generations. Such pedigrees are quite as much to be avoided as are good ones to be desired. A good pedigree has often been defined by the writer hereof as one which commences with a good animal and runs back through an ancestry all distinguished for unusual excellence for many generations, and the longer such a pedigree is the better. It is important to know that the male which is to be placed at the head of a stud, herd or flock should himself be a good one; it is important to know that his two parents, and four grandparents, and eight great-grandparents were also distinguished for excellence in the points that is desired especially to have transmitted. A pedigree, to be of any particular value, must be something more than a mere string of names. Instead of accepting the fashions that titled aristocracy may have set for us, it is vastly more important to ask: Do his steers make more and better beef from the same food than

ours? Are his sheep more famous for wool or for mutton than ours? Are his pigs hardier, do they produce sweeter hams and better bacon than ours from the same food? It is by such practical questions as these that we should try pedigrees; and we should be infinitely more concerned to know whether the immediate ancestors of an animal have been distinguished for especial excellence, than to know that the line of descent is straight from Booth or from Bates, or any other noted breeder of former years. The very marrow of pedigree consists in the qualities of an ancestry all along the line. If selecting stock from which to breed trotting horses, look at the records of the winners on the trotting turf, and judge of the merits of the ancestry accordingly. If for the dairy, search for the butter and milk records of the ancestry. This is the essence of pedigree as applied to stock breeding".

1

There are three kinds of pedigrees: First, one in which all the generations show animals of superior merit as individuals and as breeders; second, one in which the first three or four generations show animals of merit but in which the more remote lines show few familiar names and represent obscurity if not inferiority; third, one in which the fourth generation and the more remote

1. Marshall, Breeding Farm Animals, pp. 101-102.

lines show many animals of fairly earned distinction but in which the nearer generations have not come to fame and seem to rely more upon their ancestry than upon themselves or their performances. Either of the two latter pedigrees must be considered much less valuable than one in which all lines are of proven superiority, but of these latter two, the one with obscurity surrounding near relatives is inferior to the one with distinction in close lines and obscurity in remote lines.

Pedigrees of race horses, into which have been incorporated records of individuals, make them much more useful than when only the names of ancestors appear. A record of having trotted a mile in 2:10 requires no consideration of errors in judgment or unworthy competition. The standard is absolute and can be applied at any time or place. It is possible that such records may not fully represent the capabilities of the individuals because of limited opportunities, but there can be no gainsaying that fact, that under conditions surrounding the trial the animal possessed the ability to perform as recorded. This information is made available in "Wallace's Yearbook" for trotting horse breeders and is of the greatest service in the selection and the study of ancestry. For complete pedigrees of trotting horses volumes

of the "American Trotting Register" must be available.

Source of Data

The individuals used in these data were taken from the 2:10 lists published in the Christmas numbers of "The Horse World" and "The Horse Review" for the years 1911 to 1915, inclusive. These lists were compared one with the other and then checked with the entries made in "Wallace's Yearbook", volumes 27-30, inclusive, referring to the years 1911 to 1914, inclusive. Volume 31, of "Wallace's Yearbook", (which will contain the entries for 1915) was not available. The data for 1915 are as given by the Christmas numbers of "The Horse World" and "The Horse Review". Thus, the individuals used in these data represent, as accurately as possible, all trotters that have made records of 2:10 or better during the years 1911-1915, inclusive.

Method Used in Obtaining Data

In obtaining data the tabular form of pedigree was used. Figure 1, represents a complete pedigree of one 2:10 performer for five generations. The pedigrees of the individuals were obtained from volumes 8-30, inclusive, of "Wallace's Yearbook" and from volumes I-XIX, inclusive, of the "American Trotting Register". In each volume of "Wallace's Yearbook" appear the pedigrees

PETER SCOTT 2:05 $\frac{1}{4}$

Peter
the
Great
207 $\frac{1}{4}$

Jennie
Scott
2:14 $\frac{1}{4}$

Pilot Medium
1597

Santos

Bryson 2:16 $\frac{3}{4}$

Aetna

Happy Medium 400

Tackey 2:26

Grand Sentinel
2:27 $\frac{1}{4}$

Shadow

Simmons 2:28

Lena

Aberdeen 27

Etona

Hambletonian 10

Princess 2:30

Pilot Jr. 12

Jennie Lind

Sentinel 2:29 $\frac{1}{4}$

Maid of Lexington

Octoroon

Swallow

George Wilkes

Black Jane

Clark Chief Jr.

Alice

Hambletonian 10

Widow Machree

Almont 33

Abdallah
Charles Kent Mare

Ham. (Andrus')

Canadian Pilot
Nancy Pope

Bellfounder

Hambletonian 10
Lady Patriot

Mambrino Pilot

Tom Hal Jr.
Bonnie Annie

Joe Hooker

Hambletonian 10
Dolly Spanker

Mambrino Patchen
Lady Stanhope

Clark Chief

Bay Messenger

Abdallah
Charles Kent Mare

American Star 14

Abdallah 15

Edwin Forest

(Figure 1)

of all new performers entering the 2:30 list, and these pedigrees give the following information: Name of performer and registry number, if a standard stallion- Color- Sex- Date of foaling- Sire and his number, if a standard horse- Dam and her record, if a performer- Sire of dam and his number, if a standard horse- Sire of granddam and his number, if a standard horse- Reference to volumes of the "American Trotting Register", if the performer is a standard stallion, in which a more detailed pedigree is given- Name and residence of breeder- Place and date at which record was made- Record of performer. With this information, and with the use of the foregoing volumes of "Wallace's Yearbook" and the "American Trotting Register", all pedigrees of the 2:10 trotters were traced as shown in Figure 1.

Probable Error

Some difficulty was met with in tracing the pedigrees of the performers. The "American Trotting Register", unlike most Registry Associations, gives registry numbers only to the standard trotting stallions; the mares are listed alphabetically as standard or non-standard but are not given numbers. If some reference is not made to the volume in which a given female's pedigree is given, difficulty arises, due to the fact that the breeding of the mares could not be found; therefore some pedigrees are not as complete as desired. In a few

cases the breeding of the dam of the performer was unknown. In nearly all instances the breeding of the sires of performers is complete. Thus one error that might have arisen in these data would come from the incompleteness of some of the pedigrees which usually comes on the dam's side of the breeding.

Another error which might have occurred is the incorrect ancestry as presented by the Register. It is possible that a few horses have been given a fraudulent sire or dam, but these cases are so few that they may be considered as negligible in the pedigrees of the performers used in this thesis.

V. DISCUSSION OF DATA

Some Facts About the 2:10 Performers

The 2:10 performers for the years 1911-1915, inclusive, compared with all performers in the 2:10 list:- The total number of 2:10 trotters recorded in "Wallace's Yearbook", including those for the year 1915, was 775. Of this number, 314 used in this thesis, or 40.51 per cent of the total number of 2:10 trotters represent the performers which have entered the 2:10 list during the years 1911-1915, inclusive. These 314 trotters, when apportioned to the years in which their records were made appear as follows: In 1911, there were 50 new performers to enter the list; in 1912, 52; in 1913 62; in 1914, 76; and in 1915, 74. Previous to 1913, the largest number of 2:10 trotters to enter the list in one year was 56, in 1910. In 1913, sixty-two new performers entered the 2:10 list, and the following years, 1914 and 1915, inclusive, seventy-six and seventy-four new performers, respectively were entered in the 2:10 list.

A further contrast is made possible by comparing the 314 trotters for the five-year period, 1911-1915, inclusive, with trotters for similar periods previous to 1911. A comparatively small portion of the present list of 2:10 trotters were recorded up to the close of 1900, and previous to that time no provision had been made for a distinct list

of 2:10 trotters, therefore, the first period to be considered will be for the sixteen years (1884-1900, inclusive). There were recorded, prior to 1900, 123 trotters with records of 2:10 or better for the mile. Five years later, or at the close of 1905, the 2:10 list totaled 255, which was an increase of 132, or a percentage increase of 107.31 per cent over that of the 1900 list. By dividing these 132 evenly among the years of this five-year period, an average of 26.4 new 2:10 performers, for each year, is observed.

At the close of 1910, the 2:10 list totaled 461 trotters. This was an increase of 206 for the five-year period following 1905. On a percentage basis, the 206 trotters represent 44.4 per cent of the total 2:10 performers recorded up to 1910. The increase, for the five-year period, 1906-1910, inclusive, was 156.06 per cent as compared with 107.31 per cent for the five-year period preceding. The average yearly production of 2:10 trotters for this period was 41.2 as compared with 26.4 for the preceding five-year period.

At the close of 1915, the 2:10 list of trotters had reached the total of 775, and of this number 314 made their records during the years 1911 to 1915, inclusive. This was an increase of 152.42 per cent over the previous five-year period, and an increase of 237.87^{per cent}/over that of the period from 1901-1905, inclusive. Each year of this

last period contributed an average of 62.8 trotters to the 2:10 list as compared with 41.2 and 26.4 trotters per year, respectively, for the two preceding five-year periods.

That the 2:10 trotters of this latter period (1911-1915, inclusive), are the most representative of the 2:10 list is self-evident from comparisons made for similar periods in the foregoing paragraphs. Furthermore, these 314 trotters are practically all in racing circles today. Therefore, interest is directed not only to their records, but also to their breeding which involves a study of pedigrees.

Comparison as to sex: Twenty years ago (1886) the entire 2:10 list of trotters contained two more mares than stallions. At that time there were eighteen mares, sixteen stallions and ten geldings with trotting records of 2:10 or better. At present the entire list of 2:10 trotters is divided up as follows: Mares, 305; stallions, 255; and geldings, 216. That the proportion of trotting stallions with records of 2:10 or better is rapidly increasing is evident from the sex division of the new 2:10 performers of the last five years. This division is made up as follows: mares, 126; stallions, 118; and geldings, 70. The fact that stallions are becoming relatively more numerous in the 2:10 list is further shown by listing the 2:10 trotters which made their records in 1915, as follows: stallions,

34; mares, 31; and geldings 10.

Thirty-two years ago advanced registry was established for dairy cattle. It is a fact that since then the yearly milk production and butter fat records of dairy cows have been brought to a high standard. The probable factors influencing this advance in milk production and butter fat records are: better conditions, more and better feed and better cows. All three factors are fundamental, but to the last named factor especial attention has been given. With the incorporation of milk and butter records within extended pedigrees, more attention was given them, and not only was the ancestry studied, but also the performance of the ancestry.

A step comparable to the establishment of advanced registry among dairymen was taken by trotting horse men when a separate list was established for those horses making records of 2:10 or better, either at the pace or trot. The first 2:10 trotting record dates back thirty-one years, just one year later than the establishment of advanced registry for dairy cattle. It is true that some progress has been made in the production of speed among trotting horses. Thus, the record of 2:10 trotting, made by Jay-Eye-See in 1884, has been lowered to 1:58, the record now held by Uhlan which he made in 1912. No doubt the factors entering into the lowering of these records were obtained by better conditions, such

as: the light cart with pneumatic tires, scientific methods of harnessing and balancing the horses, scientific feeding, and the breeding of the best to the best.

Data on above factors are not available, but herewith is given a summary of the breeding, as to records, of the first six ancestors of the 314 performers with records of 2:10 or better trotting used in this thesis. Thus,

261 performers ¹ are by record sires ².

53 " " " no record sires.
314

123 performers are out of record dams.

191 " " " no record dams.
314

107 performers are by record sires and out of record dams.

154 performers are by record sires and out of no record dams.

16 performers are by no record sires and out of record dams.

37 performers are by no record sires and out of

no record dams.
314

-
1. A performer as used in this list refers to individuals with records of 2:10 or better at the trot.
 2. A record individual is any individual that has a record of 2:30 or better at the trot or 2:25 or better at the pace.

210 performers are by record paternal grandsires.

104 performers are by no record paternal grandsires.

314

77 performers are out of record paternal granddams.

237 performers are out of no record paternal granddams.

314

239 performers are by record maternal grandsires.

75 performers are by no record maternal grandsires.

314

62 performers are out of record maternal granddams.

252 performers are out of no record maternal granddams.

314

5 performers whose first six ancestors are record individuals.

31 performers have five record ancestors among the first six.

77 performers have four record ancestors among the first six.

108 performers have three record ancestors among the first six.

65 performers have only two record among the first six.

25 performers have only one record ancestor among the first six.

3 performers have no record ancestors among the first six.

314

The five 2:10 performers whose first six ancestors are record individuals follow: Harry J.S. 2:08 $\frac{1}{4}$, Jack Leyburn 2:04 $\frac{1}{4}$, Lee Axworthy 2:03 $\frac{1}{4}$, Lucile Spier 2:07 $\frac{3}{4}$ and The Temptress 2:08 $\frac{1}{2}$.

It will be noted that in this classification, the record sires greatly outnumber the record dams; 83.12 per cent of the 2:10 performers are by record sires while only 39.17 per cent are out of record dams- a ratio of approximately 2:1. With the grandparents the difference is greater. When the paternal and maternal grandsires and the paternal and maternal granddams are considered together, it is found that 71.49 per cent of the 2:10 performers are by record paternal and maternal grandsires while 22.49 per cent are out of record paternal and maternal granddams- a ratio of 3.1:1. The conclusion might be drawn from these data that speed is transmitted mostly through the sires, unless speed in the dams is latent or undeveloped. In view of the actual conditions surrounding parenthood in trotting males and females, and of the financial advantages of low record sires, the foregoing conclusion is scarcely warranted.

Sires of the First Generation

By tabulating the 2:10 trotters, which have made records during the last five years, under their sires, it was found that these 314 trotters of the 2:10 list were sired by 184 stallions. Some sires have more than one offspring in this list. There were forty-four sires with two or more progeny and 140, each of which had one 2:10 offspring. In Table I is given a list of the forty-four sires having two or more 2:10 progeny, and the number of 2:10 trotters sired by each.

TABLE 1

Sires Having Two or More 2:10 Progeny

No.	Sire	2:10 Progeny
1	Peter the Great 2:07 $\frac{1}{4}$	26
2	Axworthy 2:15 $\frac{1}{2}$	9
3	Jay McGregor 2:07 $\frac{1}{4}$	9
4	Todd 2:14 $\frac{3}{4}$	9
5	Moko 24457 ¹	8
6	Walnut Hall 2:08 $\frac{1}{4}$	6
7	Zombro 2:11	5
8	John A. McKerron 2:04 $\frac{1}{4}$	5
9	Bellini 2:13 $\frac{1}{4}$	5
10	Bingara 34707	5
11	Axion 2:07 $\frac{3}{4}$	4
12	Admiral Dewey 2:04 $\frac{3}{4}$	4
13	Bingen 2:06 $\frac{1}{4}$	4
14	Guy Axworthy 2:08 $\frac{3}{4}$	4
15	General Watts 2:06 $\frac{3}{4}$	4
16	Trampfast 2:12 $\frac{1}{4}$	3
17	The Exponent 2:11 $\frac{3}{4}$	3
18	San Francisco 2:07 $\frac{3}{4}$	3
19	Archdale 37304	3
20	McKinney 2:11 $\frac{1}{4}$	3
21	Prodigal 2:16	3
22	Albingen 2:18	3

1. Moko 24457, means that Moko's American trotting register number is 24457.

No.	Sire	2:10 Progeny
23	Sidney Dillon 23157	3
24	Tregantle 2:09 $\frac{1}{4}$	3
25	Almaden D. 2:19 $\frac{1}{4}$	2
26	Norval 2:14 $\frac{3}{4}$	2
27	The Director General 31738	2
28	Consternaro 2:16 $\frac{1}{4}$	2
29	Bernadotte 2:29 $\frac{1}{2}$	2
30	Red Medium 2:23 $\frac{1}{4}$	2
31	General Forrest 2:08	2
32	The Bondsman 37641	2
33	Mobel 2:10 $\frac{1}{4}$	2
34	Onward Silver 2:05 $\frac{1}{4}$	2
35	Del Coronado 2:09 $\frac{1}{2}$	2
36	Prince of India 2:13 $\frac{1}{4}$	2
37	Carolikin 2:07 $\frac{1}{2}$	2
38	Waltz 2:22	2
39	Joe Patchen 2:01 $\frac{1}{4}$ (P)	2
40	Rhythmic 2:06 $\frac{3}{4}$	2
41	Dale Axworthy 37502	2
42	Silent Brook 2:16 $\frac{1}{2}$	2
43	Binjolla 2:17 $\frac{3}{4}$	2
44	Vice Commodore 2:11	2
	Total	174
	Average	4-

It will be noticed from Table I that there is a total of 174, 2:10 performers sired by the forty-four sires. These forty-four sires with the 140 sires, each having one 2:10 performer, got the 314 trotters of the 2:10 list here studied. Each one of the 184 sires got an average of 1.74 progeny in this 2:10 list, and each of the forty-four got an average of approximately four progeny. In this table of forty-four sires, there are ten sires each of which produced five or more 2:10 performers; five, each of which produced four 2:10 performers; nine, each of which produced three 2:10 performers; and twenty, each of which produced two 2:10 performers.

The data in Table I, show that seventeen of the forty-four sires, numbers 1, 3, 6, 8, 11, 12, 13, 14, 15, 18, 24, 31, 34, 35, 37, 39, and 40, hold records of 2:10 or better at the trot (one sire, Joe Patchen 2:01 $\frac{1}{4}$, is a pacer). These seventeen sires got eighty-four of the 174 performers sired by the forty-four stallions. Twenty sires, numbers 2, 4, 7, 9, 16, 17, 20, 21, 22, 25, 26, 28, 29, 30, 33, 36, 38, 42, 43, and 44, hold records of 2:30 or better at the trot. The total number of 2:10 progeny sired by them is sixty-five, as compared with a total of eighty-four, sired by the seventeen 2:10 performers. Seven sires, numbers 5, 10, 19, 23, 27, 32, and 41, hold

no records. Their total number of 2:10 progeny in the list of 174 performers is twenty-five. These data show that the sires with records of 2:10 or better were the most prominent in producing 2:10 performers.

The foregoing facts are illustrated more clearly by considering, the 140 sires, each of which have one 2:10 offspring, with the forty-four sires each of which have two or more 2:10 offspring. The 140 sires divided as to records show that twenty-eight sires have records of 2:10 or better either at the trot or pace; eighty-two sires have records of 2:30 or better trotting or 2:25 or better pacing; and thirty sires have no records. By combining the foregoing sires the following data are obtained:

17	sires	with	records	of	2:10	or	better	got	84-2:10	trotters
28	"	"	"	"	"	"	"	"	28	"
45	"	"	"	"	"	"	"	"	112	"

Each 2:10 sire got an average of 2.5- of the performers.

20	sires	with	records	of	2:30	or	better	got	65-2:10	trotters
82	"	"	"	"	"	"	"	"	82	"
102	"	"	"	"	"	"	"	"	147	"

Each 2:30 sire got an average of 1.44 of the 2:10 performers.

7 sires with no records got 25-2:10 trotters.

30	"	"	"	"	"	30	"	"
37	"	"	"	"	"	55	"	"

Each no record sire got an average of 1.83% of the 2:10 performers.

These data show that the sires having records of 2:10 or better have been more prominent as sires of 2:10 performers. Those having no records rank second as producers of 2:10 performers, and the sires with records of 2:30 or better have the poorest records as sires of 2:10 performers. These data cannot be taken as conclusive for the total 2:10 trotters in the list, because with a greater number of sires of 2:10 trotters, the results would probably be changed, somewhat. It may be said that the results obtained in Table I, of the 2:10 sires will hold for the total number of 2:10 trotters in the list. This assertion is made because of the fact that the sires with records of 2:10 or better are given a better chance in the stud. As a rule they are put to better mares and their offspring are given a greater opportunity on the track.

TABLE 2

Ten Leading Sires of the First Generation

No.	Sire	2:10 Trotters	% of Total 2:10 Trotters
1	Peter the Great 2:07 $\frac{1}{4}$	26	8.28
2	Axworthy 2:15 $\frac{1}{2}$	9	2.86
3	Jay McGregor 2:07 $\frac{1}{4}$	9	2.86
4	Todd 2:14 $\frac{3}{4}$	9	2.86
5	Moko 24457	8	2.55
6	Walnut Hall 2:08 $\frac{1}{4}$	6	1.91
7	Zombro 2:11	5	1.59
8	John A. McKerron 2:04 $\frac{1}{4}$	5	1.59
9	Bellini 2:13 $\frac{1}{4}$	5	1.59
10	Bingara 34707	5	1.59
	Total	87	27.7
	Average	8.7	2.77

Table 2, contains a list of the ten leading sires of 2:10 performers, each stallion having sired five or more 2:10 progeny. The total 2:10 get sired by them is 87, the average 2:10 get for each sire being 8.7 as compared with 1.7, which is the average 2:10 get of the 184 sires of 2:10 performers.

Table 2, Column 4, shows the per cent of the total number of 2:10 trotters sired by each horse. For instance, Peter the Great 2:07 $\frac{1}{4}$ is the sire of 26, 2:10 trotters which is 8.28 per cent of the 314, 2:10 trotters. These ten sires produced 27.7 per cent of the 314, 2:10 trotters, or an average by each sire of 2.77 per cent of the total.

The outstanding fact in this table is the position occupied by Peter the Great 2:07 $\frac{1}{4}$. He is the sire of twenty-six 2:10 trotters which is three times as many as the next ranking sires: Axworthy 2:15 $\frac{1}{2}$, Jay McGregor 2:07 $\frac{1}{4}$ and Todd 2:14 $\frac{3}{4}$ who have nine 2:10 trotters each. Peter the Great is the premier sire of 2:10 performers, having up to the close of 1915, forty offspring in the 2:10 list. McKinney 2:11 $\frac{1}{4}$ has sired a total of twenty-one performers, which is slightly more than one-half the number gotten by Peter the Great 2:07 $\frac{1}{4}$.

In this list of ten sires there are four with records of 2:10 or better; four with records of 2:30 or better and two with no records. The number of 2:10 trotters sired by each class is: 2:10 stallions sired forty-six, 2:30 stallions sired twenty-eight, and no record stallions sired thirteen. The four 2:10 sires got an average of 11.5 performers each, the four 2:30 sires got an average of 7 performers each and the two no record sires

got an average of 6.5 performers each. It will also be noticed from the data that the sires with records of 2:10 or better are more prominent while the data covering the 2:30 and no record sires are reversed from that previously mentioned.

It is interesting to note in the breeding of these ten leading sires of 2:10 trotters that all of them trace through their male ancestry to Hambletonian 10. Thus Bellini 2:13 $\frac{1}{4}$ by Artillery 2:21 $\frac{1}{2}$ is a grandson of Hambletonian 10; Moko 24457 by Baron Wilkes 2:18, Peter the Great 2:07 $\frac{1}{4}$ by Pilot Medium 1597 and Walnut Hall 2:08 $\frac{1}{4}$ by Conductor 2:14 $\frac{1}{4}$ are great grandsons of Hambletonian 10; and Axworthy 2:15 $\frac{1}{2}$ by Axtell 2:12, Bingara 34707 by Bingen 2:06 $\frac{1}{4}$, Jay McGregor 2:07 $\frac{1}{4}$ by Jay Hawker 2:14 $\frac{3}{4}$, John A. McKerron 2:04 $\frac{1}{4}$ by Nutwood Wilkes 2:16 $\frac{1}{2}$, Todd 2:14 $\frac{3}{4}$ by Bingen 2:06 $\frac{1}{4}$ and Zombro 2:11 by McKinney 2:11 $\frac{1}{4}$ are great-great grandsons of Hambletonian 10. Grouping these sires as to families we obtain the following data.

<u>Family</u>	<u>Sires</u>
Artillery - 1 sire,	Bellini 2:13 $\frac{1}{4}$
Happy Medium- 1 sire,	Peter the Great 2:07 $\frac{1}{4}$
Electioneer- 3 sires,	(Todd 2:14 $\frac{3}{4}$ (Walnut Hall 2:08 $\frac{1}{4}$ (Bingara 34707
Wilkes- 5 sires	(Axworthy 2:15 $\frac{1}{2}$ (Jay McGregor 2:07 $\frac{1}{4}$ (Moko 24457 (John A. McKerron 2:04 $\frac{1}{4}$ (Zombro 2:11

Grouping the families according to the numbers of 2:10 trotters produced by each, we have: The Wilkes family with thirty-six 2:10 trotters; The Happy Medium, with twenty-six; The Electioneer, with twenty; and The Artillery, with five.

According to these data, the Wilkes family is the most prominent in the production of 2:10 trotters; the Happy Medium family ranks second, but has only one progenitor of extreme speed, namely, Peter the Great 2:07 $\frac{1}{4}$; and that extreme speed is coming from the Electioneer family mostly through one sire, Bingen 2:06 $\frac{1}{4}$, the grandson of Electioneer.

Sires of the Second Generation

The sires of the second generation include the sires of sires and sires of dams of the 2:10 performers. These are, respectively, the paternal and maternal grandsires of the 2:10 performers.

By tabulating the 2:10 performers under their grandsires, paternal and maternal, it is found that 284 stallions got all the stallions and mares which were the sires and dams of the 2:10 performers here studied. Each of these 284 grandsires got an average of 2.2 direct offspring (sons and daughters) which in turn became the 628 parents of the 314 performers here studied. The number of direct parents of 2:10 performers gotten by each grand-

sire ranged from 38 in case of one horse (Bingen 2:06 $\frac{1}{4}$) to 1 in case of a number of horses. Of the 284 grandsires, seventy-nine had sired two or more offspring, and the total progeny of these seventy-nine stallions was 423. Each stallion of the seventy-nine grandsires got an average of 5:35 offspring as compared with an average of 4- for the stallions of the first generation having two or more offspring each.

When the paternal and maternal grandsires are considered separately, a different view is presented. Some grandsires that appear on the sires' side as having two or more get, also appear on the dams side as having two or more get. There are forty-nine paternal grandsires having two or more get each and forty-eight maternal grandsires having two or more get each. But there are eighteen grandsires that appear both as paternal and maternal grandsires having two or more get each. The total number offspring of the forty-nine paternal grandsires is 268, an average of 5.47- progeny for each; while the total number offspring of the forty-eight maternal grandsires is 153, an average of 3.19- progeny for each.

A list of the grandsires, paternal and maternal, which had official performance records shows that:

33 grandsires with records of 2:10 or better, either at the trot or pace, got a total of 104 offspring which in turn became the sires and dams of 2:10 performers,-

each 2:10 grandsire getting an average of 3.15 offspring.

144 grandsires with records of 2:30 or better trotting or 2:25 or better pacing got a total of 343 offspring which in turn became the sires and dams of 2:10 performers,- an average of 2.38 offspring for each.

107 grandsires with no records got a total of 181 offspring which in turn became the sires and dams of 2:10 performers,- each no record grandsire getting an average of 1.78 offspring.

A list of the seventy-nine grandsires, paternal and maternal, having two or more progeny each, shows that:

14 grandsires with records of 2:10 or better, either at the trot or pace, got a total of 85 offspring (sires and dams of 2:10 performers),- each 2:10 grandsire getting an average of 6.07 offspring.

48 grandsires with records of 2:30 or better trotting or 2:25 or better pacing got a total of 247 offspring (sires and dams of 2:10 performers), an average of 5.14 offspring for each.

19 grandsires with no records got a total of 91 offspring (sires and dams of 2:10 performers),- each no record grandsire getting an average of 5.35 offspring.

These data bear out the same results as those obtained in the first generation, namely, that the 2:10

stallions are the most prominent in the production of offspring; that the 2:30 stallions are more productive than the no record stallions when the total number of stallions is considered, but when those stallions having two or more progeny each are considered the no record sires have proven themselves to be the better.

A further study is made of the ten leading sires of sires of 2:10 performers, sires of dams of 2:10 performers, and sires of sires and sires of dams of 2:10 performers, respectively, in Tables 3, 4, and 5.

Table 3

Ten Leading Sires of Sires of 2:10 Performers

Number	Sire	Sons who sired (1) or More 2:10 Perform- ers	2:10 Perform- ers Sired by Sons	% of 2:10 Per- formers Trac- ing to Sire
1	Bingen 2:06 $\frac{1}{4}$	12	33	10:51
2	Pilot Medium 1:59 $\frac{7}{8}$	2	27	8.59
3	McKinney 2:11 $\frac{1}{4}$	9	15	4.77
4	Baron Wilkes 2:18	6	14	4.45
5	Axtell 2:12	3	11	3.50
6	Electioneer 1:25	6	10	3.18
7	Axworthy 2:15 $\frac{1}{2}$	3	10	3.18
8	Jay Hawker 2:14 $\frac{3}{4}$	1	9	2.86
9	Todd 2:14 $\frac{3}{4}$	6	6	1.91
10	Moko 2:44 $\frac{5}{8}$	5	6	1.91
	Total	53	141	44.86
	Average	5.3	14.1	4.48

Table 3, includes the ten leading sires of sires of 2:10 performers. In comparing this table with Table 2, it will be noticed that three sires in Table 3, are also present in Table 2, "The Ten Leading Sires of 2:10 Performers." These are Axworthy 2:15 $\frac{1}{2}$, Todd 2:14 $\frac{3}{4}$ and Moko 24457.

Column 3, of Table 3, gives the number of sons of each paternal grandsire; Column 4, gives the number of 2:10 performers sired by these sons; and Column 5, gives the per cent of the 314 performers which have for their male progenitor the horses listed in this table. It will be noticed that these ten sires in Table 3, have fifty-three sons and these fifty-three sons sired 141 of the total number of 2:10 performers here studied. Each son got an average of 2.66 performers, and each sire in the table is the progenitor of 14.1 performers.

It will be noticed that Bingen 2:06 $\frac{1}{4}$ is the leading sire of sires of 2:10 performers, he being represented by twelve sons who sired thirty-three 2:10 performers which is 10.51 per cent of the total number of 2:10 performers. In the first generation Peter the Great 2:07 $\frac{1}{4}$ occupied the position of the leading sire of 2:10 performers, but his sire, Pilot Medium 1597, holds second position as a progenitor of 2:10 performers in this generation. This is due to the fact that Pilot Medium 1597 transmits extreme speed through only one son, namely, Peter the Great 2:07 $\frac{1}{4}$

(he has one other son, but this son sired only one 2:10 performer) while Bingen 2:06 $\frac{1}{4}$ transmits extreme speed through twelve sons. Extreme speed from Jay Hawker 2:14 $\frac{1}{4}$, in line 8, comes through one son, Jay McGregor 2:07 $\frac{1}{4}$. Todd 2:14 $\frac{3}{4}$, a son of Bingen 2:06 $\frac{1}{4}$ ranks ninth in this table and he has six sons, each being the sire of one 2:10 performer. One very noticeable fact is that Electioneer 125, a son of Hambletonian 10, is present in the list of ten leading sires of sires of 2:10 performers, being the progenitor of ten 2:10 performers.

A study of the breeding of these ten paternal grandsires shows that one sire, Electioneer 125 is a son of Hambletonian 10; Pilot Medium 1597 by Happy Medium 400, Baron Wilkes 2:18 by George Wilkes 2:22 are grandsons; McKinney 2:11 $\frac{1}{4}$ by Baron Wilkes 2:18; Axtell 2:12 by William L 4244, Jay Hawker 2:14 $\frac{3}{4}$ by Jay Bird 5060, Moko 24457 by Baron Wilkes 2:18, and Bingen 2:06 $\frac{1}{4}$ by May King 2:21 $\frac{1}{2}$ are great grandsons; and Todd 2:14 $\frac{3}{4}$ by Bingen 2:06 $\frac{1}{4}$ is a great-great grandson of Hambletonian 10. By arranging these paternal grandsires under their families when only the male line of the breeding is considered, it is found that the following families are represented:

<u>Family</u>	<u>Sires</u>
Happy Medium- 1 sire,	Pilot Medium 1597
Electioneer- 3 sires,	(Bingen 2:06 $\frac{1}{4}$ (Todd 2:14 $\frac{3}{4}$ (Electioneer 125
	(McKinney 2:11 $\frac{1}{4}$ (Baron Wilkes 2:18
George Wilkes- 6 sires	(Axtell 2:12 (Axworthy 2:15 $\frac{1}{2}$ (Jay Hawker 2:14 $\frac{3}{4}$ (Moko 24457

Listing these as to the number of 2:10 performers produced by the sons of the sires in the foregoing families, it is found that the sons of the sires in the George Wilkes family got sixty-five 2:10 performers; the sons of the sires in the Electioneer family got thirty-nine 2:10 performers; and the sons of the sire in the Happy Medium family got twenty-seven 2:10 performers.

These data show that the George Wilkes family continues to be the most prominent as the progenitor of 2:10 performers, its progeny being nearly twice that of the Electioneer family which ranks second; the Happy Medium family ranks third.

Table 4

Ten Leading Sires of Dams of 2:10 Performers

Number	Sire	Daughters who produced (1) or more 2:10 Performers	2:10 Performers produced by Daughters	% of 2:10 Performers Tracing to Sire
1	Baron Wilkes 2:18	9	12	3.82
2	Prodigal 2:16	6	8	2.54
3	Wilton 2:19 $\frac{1}{4}$	5	7	2.23
4	Axtell 2:12	6	6	1.91
5	Guy Wilkes 2:15 $\frac{1}{4}$	5	6	1.91
6	Arion 2:07 $\frac{1}{4}$	6	6	1.91
7	Kremlin 2:07 $\frac{1}{4}$	5	5	1.59
8	Bingen 2:06 $\frac{1}{4}$	5	5	1.59
9	Moko 24457	4	4	1.27
10	Shadeland Onward 2:18 $\frac{1}{4}$	4	4	1.27
Total		55	63	20.04
Average		5.5	6.3	2.004

Table 4, includes the ten leading maternal grand-sires of 2:10 performers or the ten leading sires of dams of 2:10 performers.

In comparing this table with Table 3, it will be noticed that four sires in Table 4 also occur in Table 3.

These are Baron Wilkes 2:18, Axtell 2:12, Bingen 2:06 $\frac{1}{2}$, and Moko 24457. Baron Wilkes 2:18, the leading sire of dams of 2:10 performers occupies fourth position as the sire of sires of 2:10 performers.

It will be noticed that the daughters of the sires in Table 4 produced an average of 1.14 $\frac{1}{2}$ performers each, while the sons of horses appearing in Table 3, produced an average of 2.66 $\frac{1}{2}$ performers each, a ratio of 2 $\frac{1}{2}$:1. Most of the daughters in Table 4, produced one 2:10 performer each the exceptions being the daughters of Baron Wilkes 2:18, Produgal 2:16, Wilton 2:19 $\frac{1}{4}$, and Guy Wilkes 2:15 $\frac{1}{4}$. The total number of 2:10 performers produced by daughters of sires in Table 4, is sixty-three, - each sire being a progenitor of 6.3 performers as compared with 14.1 performers per sire listed in Table 3.

The breeding of these sires shows that Arion 2:07 $\frac{3}{4}$ by Electioneer 125, Guy Wilkes 2:15 $\frac{1}{4}$ by George Wilkes 2:22, Wilton 2:19 $\frac{1}{4}$ by George Wilkes 2:22, and Baron Wilkes 2:18 by George Wilkes 2:22 are grandsons of Hambletonian 10; Shadeland Onward 2:18 $\frac{1}{2}$ by Onward 2:25 $\frac{1}{4}$, Kremlin 2:07 $\frac{3}{4}$ by Lord Russell 4677, Moko 24457 by Baron Wilkes 2:18, Axtell 2:12 by William L. 4244, Bingen 2:06 $\frac{1}{2}$ by May King 2:21 $\frac{1}{2}$ are great grandsons. Produgal 2:16 by Pancoast 2:21 $\frac{3}{4}$ is a great grandson of Mambrino Chief 11. This is the first case of any of the leading sires tracing through their male line to

a sire other than Hambletonian 10. Prodigal 2:16, holding second position as the leading sire of dams of 2:10 performers, gives to the Mambrino family some recognition as the progenitor of 2:10 performers.

A grouping of the sires under their families shows the following:

<u>Family</u>	<u>Sire</u>
Woodford Mambrino- 1 sire,	Prodigal 2:16
Electioneer- 2 sires	(Arion 2:07 $\frac{3}{4}$ (Bingen 2:06 $\frac{1}{4}$
	(Baron Wilkes 2:18 (Wilton 2:19 $\frac{1}{4}$ (Axtell 2:12
George Wilkes- 7 sires	(Guy Wilkes 2:15 $\frac{1}{4}$ (Kremlin 2:07 $\frac{3}{4}$ (Moko 24457 (Shadeland Onward 2:18 $\frac{1}{2}$

The daughters of stallions in the George Wilkes family produced forty-four 2:10 performers, the daughters of the stallions of the Electioneer family produced eleven, and the daughters of the stallion of the Woodford Mambrino family produced eight 2:10 performers. The George Wilkes family is again the most prominent as the progenitor of 2:10 performers.

Table 5

Ten Leading Grandsires (Paternal and Maternal) Of 2:10
Performers

Number	Sire	Sons Who Sired (1) or More 2:10 Performers	2:10 Performers Sired by Sons	Daughters Who Produced (1) or More 2:10 Performers	2:10 Performers Produced By Daughters	2:10 Performers Sired by Sons and Produced by Daughters	% of 2:10 Performers Tracing to Sire
1	Bingen 2:06 $\frac{1}{4}$	12	33	5	5	38	12.1
2	Pilot Medium 1597	2	27	-	-	27	8.59
3	Baron Wilkes 2:18	6	14	9	12	26	8.28
4	Axtell 2:12	3	11	6	6	17	5.41
5	McKinney 2:11 $\frac{1}{4}$	9	15	-	-	15	4.79
6	Axworthy 2:14 $\frac{1}{2}$	3	10	3	3	13	4.14
7	Electioneer 125	6	10	2	2	12	3.82
8	Jay Hawker 2:14 $\frac{3}{4}$	1	9	2	2	11	3.50
9	Guy Wilkes 2:15 $\frac{1}{4}$	4	4	5	6	11	3.50
10	Moko 24457	5	6	4	4	10	3.18
	Total	51	139	36	40	179	57.32
	Average	5.1	13.9	3.6	4.0	17.9	5.73

Table 5, includes the ten leading grandsires of 2:10 performers when both sires and dams of 2:10 performers are used

as the basis of merit. For example, Bingen 2:06 $\frac{1}{4}$ has twelve sons which sired thirty-three 2:10 performers and five daughters which produced five 2:10 performers, thus, Bingen 2:06 $\frac{1}{4}$ is the paternal and maternal grandsire of thirty-eight 2:10 performers. Therefore, 12.1 per cent of 2:10 performers here studied have Bingen 2:06 $\frac{1}{4}$ as a grandsire on either the maternal or paternal side.

These ten stallions in Table 5, are either paternal or maternal grandsires of 17.9- 2:10 performers which is 5.73 per cent of the total number of 2:10 performers here studied. Each stallion is the paternal or maternal grandsire of an average of 17.9 performers.

Table 5, as to stallions, is practically the same as Table 3, in that nine stallions appear in this table that appeared in Table 3. Guy Wilkes 2:15 $\frac{1}{4}$ is the only sire appearing in Table 5, and not appearing in Table 3. The rank of the sires is somewhat changed, as for instance, Baron Wilkes 2:18, the leading sire of dams of 2:10 performers, is third in this table while he ranked fourth in Table 3. Two sires, Pilot Medium 1597 and McKinney 2:11 $\frac{1}{4}$ do not appear on the dams' side of the breeding in the second generation because they have no daughters which produced 2:10 performers.

The breeding of these sires shows that Electioneer 125 is a son of Hambletonian 10; Pilot Medium 1597 by Happy

Medium 400, Baron Wilkes 2:18 by George Wilkes 2:22, Guy Wilkes 2:15 $\frac{1}{4}$ by George Wilkes 2:22 are grandsons; Axtell 2:12 by William L. 4244, McKinney 2:11 $\frac{1}{4}$ by Baron Wilkes 2:18, Jay Hawker 2:14 $\frac{3}{4}$ by Jay Bird 5060, Moko 24457 by Baron Wilkes 2:18 and Bingen 2:06 $\frac{1}{4}$ by May King 2:21 $\frac{1}{2}$ are great grandsons; and Axworthy 2:15 $\frac{1}{2}$ by Axtell 2:12 is a great-great grandson of Hambletonian 10.

The grouping of these stallions into families follows:

<u>Family</u>	<u>Sires</u>
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Happy Medium- 1 sire,	Pilot Medium 1597
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Electioneer- 2 sires	(Electioneer 125 (Bingen 2:06 $\frac{1}{4}$ (Baron Wilkes 2:18 (Axtell 2:12 (McKinney 2:11 $\frac{1}{4}$
George Wilkes- 7 sires	(Axworthy 2:15 $\frac{1}{2}$ (Jay Hawker 2:14 $\frac{3}{4}$ (Guy Wilkes 2:15 $\frac{1}{4}$ (Moko 24457

Thus, the George Wilkes family is the progenitor of 103, the Electioneer of fifty and the Happy Medium of twenty-seven 2:10 performers.

The data discussed in this table and Tables 3, and 4, shows that the George Wilkes family is by far the most prominent in the production of 2:10 performers; the Electioneer family ranks second; and the Happy Medium family, which has only one prominent sire of 2:10 performers, ranks third. But according to the recognized custom,

the George Wilkes, Electioneer and Happy Medium families are branches of the Hambletonian family, therefore, it may be said that extreme speed comes through certain families founded by Hambletonian 10.

Sires of the Third Generation

The sires of the third generation include the great grandsires, paternal and maternal, of the 2:10 performers here studied.

By tabulating the 2:10 performers under their great grandsires, both paternal and maternal, it was found that 417 stallions sired the mares and stallions which were the grandparents of the 2:10 performers. Each of these stallions sired an average of 2.01 $\frac{1}{2}$ progeny. There were 109 stallions of the 417, each of which sired two or more progeny. The total number of progeny sired by these 109 stallions was 948, an average of 8.69 $\frac{1}{2}$ progeny for each.

Another view is presented by considering, separately, the paternal and the maternal great grandsires. Thus, 147 stallions sired the paternal grandparents of the 2:10 performers, an average of 4.27 $\frac{1}{2}$ progeny for each; 304 stallions sired the maternal grandparents of 2:10 performers, an average of 2.06 $\frac{1}{2}$ progeny for each. There were 64 paternal great grandsires, each of which had sired two or more progeny, and the total number of progeny

(paternal grandparents of 2:10 performers) sired by them was 545, an average of 8.51 $\frac{1}{2}$ progeny for each. There were seventy-nine maternal great grand-sires, each of which had sired two or more progeny, and the total number of progeny (maternal grandparents of 2:10 performers) sired by these stallions was 403, an average of 5.1 progeny for each. These data show that the bloodlines of the sires of 2:10 performers are more intensified than the bloodlines of the dams; that is, the greater repetition of the same individual in any one generation shows that those horses in whose pedigree this occurs are more closely inbred.

A more detailed study is made of the leading great grandsires, paternal and maternal, of 2:10 performers in Tables 6, 7, and 8, which include the ten leading paternal great grandsires, the ten leading maternal great grandsires, and the ten leading paternal and maternal great grandsires, respectively, of the 2:10 performers here listed.

Table 6

Ten Leading Grandsires of Sires of 2:10 Performers

Number	Sire	Sons	Get	Daughters	Produce	Direct Offspring of Sons and Daugh- ters	% of Sires of 2:10 Performers Tracing to Sire
1	George Wilkes 2:22	12	52	4	4	56	17.83
2	Happy Medium 400	2	29	6	14	43	13.69
3	May King 2:21½	1	33	-	-	33	10.51
4	Grand Sentinel 2:27¼	-	-	2	28	28	8.91
5	Electioneer 125	9	20	2	2	22	7.00
6	Director 2:17	4	11	7	10	21	6.70
7	Baron Wilkes 2:18	5	13	6	7	20	6.37
8	Aloyone 2:27	3	19	-	-	19	6.05
9	Hambletonian 10	4	18	1	1	19	6.05
10	Jay Bird 5060	3	18	-	-	18	5.73
	Total	43	213	28	66	279	88.84
	Average	4.3	21.3	2.8	6.6	27.9	8.84

Table 6 includes the ten leading paternal great grand-
sires of 2:10 performers, or the ten leading sires of the

paternal grandparents of 2:10 performers. It will be noticed that this list of ten horses includes two that have been studied in previous tables. These horses are Baron Wilkes 2:18 and Electioneer 125. Baron Wilkes 2:18 ranked fourth among the ten leading sires of sires of 2:10 performers, first among the ten leading sires of dams of 2:10 performers, and third among the ten leading sires of sires and of dams of 2:10 performers, and in Table 6, he ranks seventh among the ten leading sires of paternal grandparents of 2:10 performers. Electioneer 125 ranked sixth among the ten leading sires of sires of 2:10 performers and seventh among the ten leading sires of sires and of dams of 2:10 performers, and in Table 6, he ranks fifth among the ten leading sires of paternal grandparents of 2:10 performers.

This table shows the number of sons (column 3), the sons get (column 4), number of daughters (column 5), the daughters produce (column 6), the total direct offspring of sons and daughters (column 7), and the per cent of sires (column 8) of 2:10 performers that trace either through their sire or dam or through both to the stallion listed in the table. Thus, George Wilkes 2:22, the leading paternal great grandsire, has twelve sons who got fifty-two sires of 2:10 performers; he has four daughters who produced four sires of 2:10 performers; and the sum of the two which is fifty-six, represents the number of sires of 2:10 performers that trace

directly to George Wilkes 2:22, either through their sire or dam. But fifty-two sires trace through their sires and only four sires trace through their dams to George Wilkes 2:22, or 17.83 per cent of the sires of the 2:10 performers trace to George Wilkes 2:22.

By taking the totals and averages into consideration, it is found that these ten stallions in Table 6, are the grandsires in the male line of 213 sires of 2:10 performers and are the grandsires in the female line of only sixty-six sires of 2:10 performers; or 88.84 per cent of the sires of 2:10 performers trace to these ten stallions either through their sire or dam.

It is interesting to note that Hambletonian 10, the most famous progenitor of trotting horses, appears in the third generation as one of the leading sires, ranking ninth in Table 6, "Ten Leading Grandsires of Sires of 2:10 Performers", he being the grandsire of nineteen sires of 2:10 performers; or, 5.76 per cent of the sires of 2:10 performers trace in the third generation to Hambletonian 10 through eighteen sires of sires of performers and through one dam of sires of performers.

Grand Sentinel 2:27 $\frac{1}{4}$, who holds fourth rank as the great grandsire of 2:10 performers, has no sons that produced anything in this list of 314 performers. It will be noticed that he has only two daughters and the produce of these two,

totals twenty-eight. One of these daughters is Santos, the dam of Peter the Great 2:07 $\frac{1}{4}$. Since Peter the Great 2:07 $\frac{1}{4}$ appeared twenty-seven times in the ancestry of these 2:10 performers, then Grand Sentinel 2:27 $\frac{1}{4}$ was the sire of only one other dam that appeared in the first three generations of these 314 performers.

The breeding of these ten stallions shows that three stallions: George Wilkes 2:22, Happy Medium 400, and Electioneer 125, are sons of Hambletonian 10; and six stallions: May King 2:21 $\frac{1}{2}$ by Electioneer 125, Grand Sentinel 2:27 $\frac{1}{4}$ by Sentinel 2:29 $\frac{1}{4}$, Director 2:17 by Dictator 113, Baron Wilkes 2:18 by George Wilkes 2:22, Aloyone 2:27 by George Wilkes 2:22, and Jay Bird 5060 by George Wilkes 2:22, are grandsons of Hambletonian 10.

A grouping of these sires under their families follows:

<u>Family</u>	<u>Sires</u>
George Wilkes- 4 sires	(George Wilkes 2:22 (Baron Wilkes 2:18 (Aloyone 2:27 (Jay Bird 5060
Electioneer- 2 sires	(Electioneer 125 (May King 2:21 $\frac{1}{2}$
Hambletonian- 2 sires	(Hambletonian 10 (Grand Sentinel 2:27 $\frac{1}{4}$
Happy Medium- 1 sire, Happy Medium 400	
Dictator- 1 sire	Director 2:17

Thus far the prominent families appearing in the ancestry of the 2:10 performers, are the George Wilkes, Electioneer, and Happy Medium. Two other families have occurred in preceding discussions,- the Artillery and Woodford Mambrino. In Table 6, two new families appear, the Hambletonian and Dictator. The Hambletonian family is represented by two sires, Hambletonian 10, the founder of the family and Grand Sentinel 2:27 $\frac{1}{2}$. The Dictator family has only one sire, Director 2:17. If in this table of ten leading grandsires of 2:10 performers George Wilkes 2:22, Electioneer 125, and Happy Medium 400 had no direct offspring, then they would be considered under the Hambletonian 10 family because they are sons of Hambletonian 10, but since each of the above three sires has sons in this list of ten sires they are included in the families which they have founded, respectively, the George Wilkes, Electioneer and Happy Medium and not in the Hambletonian family.

A study of the sires in Table 6, that appear in each family shows that the George Wilkes family, including himself, is the direct progenitor of 113 sires of 2:10 performers; the Electioneer family, including himself, is the progenitor of fifty-five sires; the Hambletonian family, including himself, and not including his three sons who were family founders, is the progenitor of forty-seven sires; the Happy Medium family, represented by only its

founder, is the progenitor of forty-three sires; and the Dictator family through Director 2:17 is the progenitor of twenty-one sires of 2:10 performers.

Table 7

Ten Leading Grandsires of Dams of 2:10 Performers

Number	Sire	Sons	Get	Daughters	Produce	Direct Offspring of Sons and Daughters	% of Dams and 2:10 Performers Tracing to Sire
1	George Wilkes 2:22	14	43	1	1	44	14.00
2	Electioneer 125	16	31	1	1	32	10.18
3	Nutwood 2:18 $\frac{3}{4}$	7	7	5	8	15	4.76
4	Baron Wilkes 2:18	4	9	5	5	14	4.44
5	Pancoast 2:21 $\frac{3}{4}$	4	13	1	1	14	4.44
6	Red Wilkes 1749	3	6	8	8	14	4.44
7	Onward 2:25 $\frac{1}{4}$	7	10	2	2	12	3.82
8	Robert McGregor 2:17 $\frac{1}{2}$	3	3	4	7	10	3.18
9	Sultan 1513	2	4	4	6	10	3.18
10	Lord Russell 4677	4	8	1	1	9	2.86
	Total	64	134	32	49	174	55.30
	Average	6.4	13.4	3.2	4.0	17.4	5.53

Table 7, includes the ten leading maternal great grandsires of 2:10 performers, or the ten leading sires of the maternal grandparents of 2:10 performers.

A study of the sires in this table shows that three horses appear in this table that appeared in Table 6. These are George Wilkes 2:22, Electioneer 125, and Baron Wilkes 2:18. It is to be noted that George Wilkes 2:22, the leading sire of paternal grandparents of 2:10 performers, is also the leading sire of maternal grandparents of 2:10 performers. Electioneer 125 is more prominent as the sire of maternal grandparents, being the grandsire of thirty-two dams of 2:10 performers, while in Table 6, he was the grandsire of only twenty-two sires of 2:10 performers. Seven sires appear in Table 7, that have not appeared in any of the preceding tables.

The arrangement of this table is similar to that of Table 6, except that column 8, shows the per cent of dams of 2:10 performers tracing to the sires listed in the table.

A study of the totals and averages of these ten sires shows that the ten sires got sixty-four sons, who in turn sired 134 progeny (dams of 2:10 performers), an average of 13.4 progeny for each. The ten sires got thirty-two mares, who in turn produced forty progeny (dams of 2:10 performers), an average of four progeny for each. The total

number of progeny of the sons and daughters in this table was 174, an average of 17.4 progeny for each sire in the table. Thus, 55.3 per cent of the dams of 2:10 performers had as their progenitors the ten sires listed in Table 7.

The breeding of these ten sires presents some new facts. Thus, George Wilkes 2:22, Electioneer 125, are sons of Hambletonian 10; Baron Wilkes 2:18 by George Wilkes 2:22, Red Wilkes 1749 by George Wilkes 2:22, Onward 2:25 $\frac{1}{4}$ by George Wilkes 2:22, and Lord Russell 4677 by Harold 413, are grandsons of Hambletonian 10; Nutwood 2:18 $\frac{3}{4}$ by Belmont 64 and Robert McGregor 2:17 $\frac{1}{2}$ by Major Edsall 2:29, are great grandsons of Hambletonian 10; Pancoast 2:21 $\frac{3}{4}$ by Woodford Mambrino 2:21 $\frac{1}{2}$ is a grandson of Mambrino Chief 11; and Sultan 1513 by the Moor 870 is a great-great grandson of Henry Clay 8, the founder of the Clay family of American trotters.

Grouping the ten sires under families, we have the following results:

<u>Family</u>	<u>Sires</u>
George Wilkes--four sires	(George Wilkes 2:22 (Baron Wilkes 2:18 (Red Wilkes 1749 (Onward 2:25 $\frac{1}{4}$
Abdallah 15--two sires	(Nutwood 2:18 $\frac{3}{4}$ (Robert McGregor 2:17 $\frac{1}{2}$
Electioneer--one sire	Electioneer 125
Woodford Mambrino- one sire	Pancoast 2:21 $\frac{3}{4}$
Harold--one sire	Lord Russell 4677
Clay--one sire	Sultan 1513

Table 7 shows that the George Wilkes family is the progenitor of 84 dams of 2:10 performers; the Electioneer family of thirty-two dams; the Abdallah 15 family of twenty-five dams; the Woodford Mambrino family of fourteen dams; the Clay family of ten dams; and the Harold family of nine dams. Since George Wilkes 2:22, Electioneer 125, Abdallah 15, and Harold 413 are sons of Hambletonian 10, then the Hambletonian 10 family is the progenitor of 150 dams of 2:10 performers; the Mambrino family of fourteen dams, and the Clay family of ten dams. These data show that although the Mambrino and Clay families appear as the leading progenitors of dams of 2:10 performers, the Hambletonian is by far the most prominent, being the progenitor of 47.78 per cent of the dams of 2:10 performers as compared with 4.47 and 3.18 per cent respectively, for the Mambrino and Clay families.

Table 8

Ten Leading Grandires of Sires and Dams of 2:10 Performers

Number	Sire	Paternal Line					Maternal Line					Direct Offspring of Sons and Daughters of Both Lines	% of Sires and Dams of 2:10 Performers Tracing to Sire
		Sons	Get	Daughters	Produce	Direct Offspring of Sons and Daughters	Sons	Get	Daughters	Produce	Direct Offspring of Sons and Daughters		
1	George Wilkes 2:22	12	52	4	4	56	14	43	1	1	44	100	15.92
2	Electioneer 125	9	20	2	2	22	16	31	1	1	32	54	8.58
3	Happy Medium 400	2	29	6	14	43	1	1	3	3	4	47	7.48
4	May King 2:21½	1	33	-	-	33	1	5	-	-	5	38	6.04
5	Baron Wilkes 2:18	5	13	6	7	20	4	9	5	5	14	34	5.40
6	Nutwood 2:18¼	2	3	8	12	15	7	7	5	8	15	30	4.76
7	Grand Sentinel 2:27¼	-	-	2	28	28	-	-	1	2	2	30	4.76
8	Director 2:17	4	11	7	10	21	2	4	2	2	6	27	4.30
9	Red Wilkes 1749	2	3	3	9	12	3	6	8	8	14	26	4.14
10	Jay Bird 5060	3	18	-	-	18	5	6	1	1	7	25	3.98
	Total	40	182	38	86	268	53	112	27	31	143	411	65.36
	Average	4.0	18.2	3.8	8.6	26.8	5.3	11.2	2.7	3.1	14.3	41.1	6.53

Table 8 includes the ten leading paternal and maternal great grandsires of 2:10 performers, or the ten leading grandsires of the paternal and maternal grandparents of 2:10 performers.

A study of the sires listed in this table shows that George Wilkes 2:22, Electioneer 125, and Baron Wilkes 2:18, appear in all three tables- Tables 6,7, and 8 as the leading sires of the third generation. Happy Medium 400, May King 2:21 $\frac{1}{2}$, Grand Sentinel 2:27 $\frac{1}{4}$, Director 2:17, and Jay Bird 5060, appear in Table 6, "Ten Leading Paternal Great Grandsires of 2:10 Performers," and also in the foregoing table. Nutwood 2:18 $\frac{3}{4}$ and Red Wilkes 1749 appear in Table 7- "Ten Leading Maternal Great Grandsires of 2:10 Performers," and in the foregoing table. George Wilkes 2:22 is the leading sire in the third generation, heading the list in each of Tables 6,7, and 8. Electioneer 125, although ranking fifth in Table 6, ranks second in Tables 7 and 8.

A study of Table 8 shows that one sire, May King 2:21 $\frac{1}{2}$ has one son and no daughters both in the paternal and maternal line of breeding of the 314 performers here studied. This one son is Bingen 2:06 $\frac{1}{4}$. On the other hand, Grand Sentinel 2:27 $\frac{1}{4}$ has in reality only one daughter and no sons in the paternal and maternal lines. This one daughter is Santos, the dam of Peter the Great 2:07 $\frac{1}{4}$.

It will be noticed that in Table 8, George Wilkes 2:22 has twelve sons (column 3) which are the paternal grandsires of 2:10 performers here studied. These twelve sons sired fifty-two offspring (column 4) which are sires of 2:10 performers. George Wilkes has four daughters (column 5) which are paternal granddams of the 2:10 performers. These four daughters produced four offspring (column 6) which are sires of the 2:10 performers. The total number offspring of the above sons and daughters (paternal grandsires and granddams) is fifty-six (column 7).

George Wilkes has fourteen sons which are the maternal grandsires of the 2:10 performers. These fourteen sons sired forty-three offspring (column 9) which are dams of 2:10 performers. George Wilkes has one daughter (column 10) which is a maternal granddam of the 2:10 performers. This daughter produced one offspring (column 11) which offspring is a dam of a 2:10 performer. The total number offspring of the sons and daughters (maternal grandsires and granddams) is forty-four (column 12). The total number offspring (sires and dams of 2:10 performers) of sons and daughters, both on the paternal and maternal line, is 100 (column 13). The percentage of offspring (sires and dams of 2:10 performers) of the sons and daughters, which are the paternal and maternal grandsires and granddams of the 2:10 performers, tracing to George Wilkes is 15.92 per cent.

Thus, forty sons (paternal grandsires of 2:10 performers) of the ten stallions listed in Table 8, sired 182 offspring (sires of 2:10 performers), an average of 18.2 offspring for each. Thirty-eight daughters (paternal granddams of 2:10 performers) produced eighty-six offspring (sires of 2:10 performers) an average of 8.6 for each sire listed in the table which is less than one-half the average produced by the sons. The forty foregoing sons and the eighty-six foregoing daughters produced 268 offspring (sires of 2:10 performers), an average of 26.8 offspring for each sire listed in Table 8.

Fifty-three sons (maternal grandsires of 2:10 performers) sired 112 offspring (dams of 2:10 performers), an average of 11.2 offspring for each sire listed in Table 8. Twenty-seven daughters (maternal granddams of 2:10 performers) produced thirty-one offspring (dams of 2:10 performers), an average of 2.7 offspring for each sire listed in Table 8, which is less than one-fourth of the average sired by the sons. The total number of offspring (dams of 2:10 performers) produced by the fifty-three foregoing sons and the twenty-seven foregoing daughters was 143, an average of 14.3 offspring for each of the sires listed in Table 8. This average for the sires made by their sons and daughters (maternal grandsires and granddams of 2:10 performers) is a fraction more than one-half of the average made by their sons and daughters which were paternal grandsires and granddams of 2:10 performers.

The total number of offspring (sires and dams of 2:10 performers) produced by the sons and daughters (paternal and maternal grandsires and granddams of 2:10 performers) of these ten sires was 411, an average of 41.1 offspring for each sire. It was found that 65.36 per cent of the sires and dams of 2:10 performers traced in the third generation to the ten sires listed in Table 8.

The breeding of these ten leading paternal and maternal great grandsires of 2:10 performers shows that George Wilkes 2:22, Electioneer 125, and Happy Medium 400, are sons of Hambletonian 10; May King 2:21½ by Electioneer 125, Baron Wilkes 2:18 by George Wilkes 2:22, Grand Sentinel 2:27¼ by Sentinel 2:29, Director 2:17 by Dictator 113, Red Wilkes 1749 by George Wilkes 2:22, Jay Bird 5060 by George Wilkes 2:22, are grandsons of Hambletonian 10; and Nutwood 2:18¾ by Belmont 64 is a great grandson of Hambletonian 10. Three sires are direct sons, six are grandsons, and one is a great grandson.

When grouped into families, the sires appear as follows:

<u>Family</u>	<u>Sires</u>
George Wilkes-- 4 sires	(George Wilkes 2:22 (Baron Wilkes 2:18 (Red Wilkes 1749 (Jay Bird 5060
Electioneer- 2 sires	(Electioneer 125 (May King 2:21½
Happy Medium- 1 sire	(Happy Medium 400
Abdallah 15- 1 sire	(Nutwood 2:18¾
Dictator- 1 sire	(Director 2:17
Hambletonian- 1 sire	(Grand Sentinel 2:27¼

By arranging the families according to the number of sires and dams of 2:10 performers that trace to them, it is found that 185 sires and dams of 2:10 performers trace to the George Wilkes family; ninety-two to the Electioneer family; forty-seven trace to the Happy Medium family; thirty trace to each of the Hambletonian and Abdallah 15 families; and twenty-seven trace to the Dictator family. Here again George Wilkes, Electioneer, and Happy Medium, the leading families which are the progenitors of the 2:10 performers, rank in the order named.

These data relative to the leading sires in the ancestry of the 2:10 performers studied in this thesis, indicate that extreme speed has been transmitted, in numbers sufficiently large to warrant recognition, mostly through three families, namely, the George Wilkes, the Electioneer, and the Happy Medium, ranking in the order named. The direct sires of the sire of each family that possessed the ability to "breed on" extreme speed were: Baron Wilkes 2:18, William L. 4244, and Jay Bird 5060 of the George Wilkes family, May King 2:21½ of the Electioneer family, and Pilot Medium 1597 of the Happy Medium family. The foregoing sires had as their sons Moko 24457, Axtell 2:12, Jay McGregor 2:07½, Bingen 2:06½, and Peter the Great 2:07½, all prominent as sires and grandsires of 2:10 performers.

A Composite Pedigree of Performers

A pedigree is defined as the record of the lineage or ancestry of an individual. Different forms of pedigrees, some, because they are more economical of space, and some, because they give a long line of descent on one side, have been used, but no other form is comparable with that shown in Figure 1, because it shows every line of descent. Figure 1, is a form for only one individual's pedigree. Now, if on a similar form, the pedigrees of the 314 performers could be shown, valuable information about their breeding would be gained, because a comparative study of the pedigrees could be made. A composite pedigree including three generations of ancestors of the 314 performers, wherein only the totals of the horses appearing are used, would appear as follows:

Figure 2

It will be seen from the foregoing composite pedigree that the 314 performers had for their parents 628 horses (sires and dams of the 314, 2:10 performers), for their grandparents 1256 horses (sires and dams of the 628 parents), and for their great grandparents 2512 horses (sires and dams of the 1256 grandparents). On making a study of the sires and dams of the first generation, the sires and dams of the second generation and the sires of the third generation, it was found that some sires and dams appeared more than once, that is, some sires and dams had two or more progeny each. It was found that by using the actual numbers of different individuals in the foregoing generations, a composite pedigree of these 314 performers appeared as follows:

(Figure 3)

Composite Pedigree of the 2:10
Performers, Showing the Numbers
of Different Individuals Appearing
in each Generation.

	(are by 184 sires	(are by 284 sires	(
	(	(	(
	(	(	(
314 performers	(and	(and	(are by
	(	(	(417
	(	(	(sires
	(	(	(
	(out of 299 dams	(out of 442 dams	(

-
1. The dams of the third generation which are the great granddams of the 2:10 performers are not included in this table.
 2. Five dams were unknown.
 3. Sixteen dams were unknown.

Figure 3, shows the actual number of different horses (stallions and mares) that appeared in the pedigrees of the first three generations of the 314 performers here studied. Thus, according to Table 9, there are 314 sires and 314 dams which include the parents of these 314 performers. A study of the sires shows that these 314 performers were sired by 184 different sires,- some sires having sired more than one 2:10 performer. Upon studying the dams it was found that the 314 performers were produced by 299 dams,- some dams produced two or more 2:10 performers. From this discussion, it is seen that the 314 performers had as their parents (sires and dams of the first generation) 184 different sires and 299 different dams.

The second generation includes the paternal and maternal grandparents of 2:10 performers. According to Figure 2, there are 628 paternal grandparents and 628 maternal grandparents. No distinct line was drawn between the two grandparents- they were studied together. It was found that the 628 parents (sires and dams) of 2:10 performers were sired by 284 different sires and produced by 442 different dams. This shows that although there were 628 matings, only 284 sires were mated with 442 dams in the production of the 184 sires and 299 dams which are the sires and dams of 2:10 performers.

The third generation includes the paternal and maternal great grandparents of 2:10 performers. According to Figure 2, there are 1256 paternal great grandparents and 1256 maternal great grandparents. The great granddams were not studied. By considering the paternal and maternal great grandsires together, it was found that the 284 grandsires and 442 granddams of the 2:10 performers were sired by 417 stallions, the great grandsires of the performers. Summarizing the foregoing discussions it is found that 417 sires produced the 284 grandsires and 442 granddams of 2:10 performers; the 284 grandsires mated with 442 granddams produced the 184 sires and 299 dams which are the direct parents of the 2:10 performers here studied.

As shown in Table 1, there were forty-four stallions that sired two or more progeny. These forty-four sires got a total number of 174, 2:10 performers which is more than one-half of the 2:10 performers here studied. By considering only the sires of these forty-four stallions and then the sires of their sires which are the "top" male line great grandsires, it was found that these forty-four sires were gotten by thirty-one stallions (grandsires of 2:10 performers) and that these 31 grandsires were gotten by eighteen stallions (great grandsires of 2:10 performers). Of these eighteen great grandsires, four are sons of Hambletonian 10, ten are grandsons, two are great grandsons,

one is Hambletonian, himself and one is a son of Mambrino Chief. Thus, these 174 performers have Hambletonian 10 seventeen times as their male line progenitor and Mambrino Chief only once. In the above data it must be remembered that the dams of the sires and the dams of the sires of sires of 2:10 performers were not considered. Summarizing the foregoing paragraph, it is found that:

174 performers are by 44 sires- the 44 sires are by 31 grandsires- and the 31 grandsires are by 18 great grandsires of 2:10 performers. Thus, 174 performers trace to eighteen great grandsires through their top sire.

The Leading Sires Appearing in the Pedigrees of the
2:10 Performers

It will be remembered that in all cases, where it was possible, the pedigree of each 2:10 performers was traced as shown in Figure 1, that is, each pedigree included five generations of ancestors for each 2:10 performer.

In Tables 1 to 8, inclusive, a study was made of the sires appearing in the first three generations of the ancestors of the 2:10 performers here studied. That the first three generations of sires are the more important is self evident. They are the near ancestors of the 2:10 performers, and as such, exerted a more direct influence on the production of speed. It seems evident, however, that the sires of the fourth and fifth generations deserve much credit for this speed. These remote sires, although not in themselves performers, possessed inherent speed qualities which were developed and intensified in their sons, grandsons and great grandsons and which were ultimately transmitted to the 2:10 performers here studied. With this in mind, a table showing the leading sires, that appeared most frequently in the pedigrees of the 2:10 performers, was prepared.

Table 9

The Leading Sires Appearing in the Pedigrees of 2:10 Performers - Generation and Line of Ancestry (Paternal or Maternal) in Which They Appear

Sire	Second Generation			Third Generation			Fourth Generation			Fifth Generation			Paternal Total	Maternal Total	Paternal and Maternal Total
	Paternal	Maternal	Total	Paternal	Maternal	Total	Paternal	Maternal	Total	Paternal	Maternal	Total			
Hambletonian 10	-	-	-	19	5	24	159	143	302	387	330	717	549	478	1027
Mambrino Chief 11	-	-	-	-	-	-	21	13	34	155	166	321	176	179	355
Pilot Jr. 12	-	-	-	-	-	-	31	11	42	34	43	77	65	54	119
George Wilkes 2:22	-	-	-	56	44	100	135	114	249	124	80	204	315	238	553
Electioneer 125	10	2	12	22	32	54	62	32	94	16	11	27	110	77	187
Mambrino Patchen 58	-	-	-	2	6	8	53	47	100	117	95	212	172	148	320

The six sires in Table 9, were chosen irrespective of the generation in which they appeared, and on the basis of the number of times which they appeared in the pedigrees of the 314 performers here studied. It will be noticed that each sire appeared more than 100 times. There were a few sires that appeared fifty or more times, but less than 100. However there were not enough of them to be considered. It will be further noticed that only one sire, Electioneer 125, appeared in the second generation of the pedigrees of the 2:10 performers. This is no doubt due to the fact that he is the youngest. Two sires Mambrino Chief 11 and Pilot Jr. 12 did not appear in the third generation. Beyond the third generation all sires appear.

A study of the six sires shows that three sires,- Hambletonian 10, Mambrino Chief 11 and Pilot Jr. 12 represent families bearing their names. The three other sires, George Wilkes 2:22, Electioneer 125 and Mambrino Patchen 58 are sons of Hambletonian 10 and Mambrino Chief 11. George Wilkes 2:22 and Electioneer 125 are sons of Hambletonian 10 and Mambrino Patchen is a son of Mambrino Patchen 58. Pilot Jr. 12 had no son sufficiently prominent to enter this list of six leading sires. No doubt, fifty years hence some of the sires that are prominent in the near ancestors of these 2:10 performers will hold the same position as the six sires

discussed here. The only factor which seems to prevent their prominence is age, and on this account their progeny has not had a chance to prove itself.

It will be noticed from this table that Hambletonian 10 appears 1027 times in the pedigrees of the 2:10 performers here studied, or the 314 performers trace 1027 times to Hambletonian 10. The 314 performers, however, traced 355 times to Mambrino Chief 11, a half brother of Hambletonian 10, and the founder of the Mambrino family. Thus, Hambletonian 10 made nearly three times as many appearances in the pedigrees of 2:10 performers as did Mambrino Chief 11, his half brother. These 314 performers trace 119 times to Pilot Jr. 12, who, although not the founder of the Pilot family, is the stallion through which the Pilot family received its fame. Pilot Jr.'s influence comes mostly through females, he being the sire of two of the most noteworthy mares in trotting history. The two mares, Miss Russell and Midnight, appear frequently in the pedigrees of the 2:10 performers.

But these 314 performers trace 553 times to George Wilkes 2:22 and 187 times to Electioneer 125, sons of Hambletonian 10, and 320 times to Mambrino Patchen 58, a son of Mambrino Chief 11. According to these data, the 314 performers trace to Hambletonian 740 times through his sons George Wilkes 2:22 and Electioneer 125 and they trace

to Mambrino Chief 11, 320 times through his son Mambrino Patchen 58. However, George Wilkes 2:22 appears 204, and Electioneer 125 appears twenty-seven times in the fifth generation which appearance is not included in the number of times Hambletonian 10 appears, because only the first five generations were considered, and where ever George Wilkes 2:22 and Electioneer 125, or any other sons or daughters of Hambletonian 10 appear in the fifth generation, the sixth generation would have to be taken into consideration in order to get the actual number of times the 314 performers trace to Hambletonian 10. The same applies to Mambrino Chief 11. His son, Mambrino Patchen 58, appears 212 times in the fifth generation and this number is not included in the number of times the 314 performers trace to Mambrino Chief 11, as the sixth generation would have to be taken into consideration in obtaining the number of times the performers trace to Mambrino Chief provided he has no other sons or daughters in the fifth generation.

This is, however, known:- George Wilkes 2:22 appears 100 times in the third generation and 249 times in the fourth. Hambletonian 10, being his sire, appears 100 times in the fourth generation as the sire of George Wilkes 2:22, and 249 times in the fifth generation. But George Wilkes 2:22 appears 204 times in the fifth generation, consequently Hambletonian 10 appears

an additional 204 times in the sixth generation. From the table it will be noticed that Hambletonian 10 makes his appearance 349 times through George Wilkes 2:22 in the five generations of the pedigrees of the 2:10 performers and an additional 204 times were the sixth generation considered.

The same may be said of Electioneer 125.

Electioneer 125 appears 187 times in the pedigrees of the 2:10 performers, twenty-seven of these 187 appearances being in the fifth generation. Then the 314 performers trace 160 times through Electioneer 125 to Hambletonian 10 within the first five generations, and an additional twenty-seven times were the sixth generation considered.

By considering George Wilkes 2:22 and Electioneer 125 together, it is found that the 314 performers trace, within the first five generations, 509 times to Hambletonian 10 through them. This shows that practically one-half the blood coming from Hambletonian 10, in the first five generations, comes through his two sons, George Wilkes 2:22 and Electioneer 125. These 314 performers trace 518 times (1027 minus 509) to Hambletonian 10 through sons and daughters other than the two prominent sons, George Wilkes 2:22 and Electioneer 125. George Wilkes 2:22 and Electioneer 125 appear 231 times in the fifth generation, which 231 times is not included in the 1027 times that Hambletonian 10 appears in the five generations. Thus, Hambletonian 10

appears 1258 times (1027 plus 231) in the pedigrees of the 2:10 performers of which appearances 140 came through his two sons George Wilkes and Electioneer. It is true that there are a few other sons besides George Wilkes and Electioneer appearing in the fifth generation, but they are not many. In most instances Hambletonian 10 appears within the first six generations of the present day trotters.

The foregoing discussion also applies to Mambrino Chief 11 and Mambrino Patchen 58. Mambrino Patchen 58 appears eight times in the third generation of the performers and in the fourth generation he appears 100 times. Accordingly Mambrino Chief 11 appears eight times in the fourth generation and 100 times in the fifth generation as the sire of Mambrino Patchen 58. Thus the 314 performers trace 108 times to Mambrino Chief 11 through his son Mambrino Patchen 58. The 314 performers trace 355 times to Mambrino Chief 11 and 108 of these 355 appearances are through Mambrino Patchen 58, then 314 performers trace 247 times (355 minus 108) to Mambrino Chief 11 through sons and daughters other than Mambrino Patchen 58. Mambrino Patchen 58 appears 212 times in the fifth generation which appearance is not included in the 355 appearances of Mambrino Chief 11 as only the first five generations are considered. Including the sixth generation Mambrino Chief 11 appears 567 times (355 plus 212) in the pedigrees of the performers not counting sons and

daughters appearing in the fifth generation other than Mambrino Patchen 58.

These data show that the 2:10 performers here studied trace to Hambletonian 10, 1027 times within the first five generations, but through George Wilkes 2:22 and Electioneer 125 the performers trace an additional 231 times to Hambletonian 10 in the sixth generation. This makes 1258 times that the 314 performers tracing to Hambletonian 10.

These 2:10 performers trace to Mambrino Chief 11 355 times through all sons and daughters within the first five generations, but trace 108 times to Mambrino Chief 11 through his son Mambrino Patchen 58, and were the sixth generation considered, these 2:10 performers would trace an additional 212 times to Mambrino Chief 11 through his son Mambrino Patchen 58, which would make a total of 567 times that the performers trace to Mambrino Chief 11, not counting other sons and daughters that appeared in the sixth generation.

These 314 performers trace to Pilot Jr. 12, 119 times.

Besides tracing to the above named stallions, these 2:10 performers trace to horses of the Clay, the Hal, and the Morgan families. There are some that trace direct to Messenger, some to Thoroughbred blood, some to saddle

horse blood and some to bloodlines which are unknown.

It is evident from these data that there were only six sires prominent enough to appear 100 or more times among the remote ancestors of the 2:10 performers, and these six sires, although not altogether the foundation of extreme speed in the American trotting horse, did possess the greatest influence in producing extreme speed.

FIVE GREAT SIRES AND FACTS CONCERNING THEM

There have been five sires whose influence was manifested as outstanding in the production of 2:10 trotters. Let it be understood that not all of these stallions were direct sires of 2:10 performers, but their prominence in the ancestry of these performers deserves further consideration. The greatness of these sires would permit of a lengthy discussion; but no attempt will be made to give details, only outstanding facts concerning each will be mentioned.

Peter the Great 2:07½

Peter the Great 2:07½, the leading sire of 2:10 trotters here studied, bred by D. D. Streeter of Kalamazoo, Michigan, was foaled in 1895. His sire was Pilot Medium 1597, Michigan's foremost speed progenitor, and his dam was Santos, the daughter of Grand Sentinel 2:27½, who, in her and another distinguished daughter, Sorrento, receives credit for having begotten the two greatest trotting brood mares of the present day. For extended pedigree of Peter the Great 2:07½ refer to Figure 4.

As a three-year-old Peter the Great made a record of 2:12½. Immediately after making this record he was bought by J. Malcolm Forbes for the sum of \$20,000.00. As a four-year-old on the Grand Circuit at New York, he trotted a mile to a record of 2:07½, which he never had a chance to lower,

Pilot Medium
1597

Happy Medium 400

Tackey
2:26

Grand Sentinel
2:27 $\frac{1}{4}$

Santos

Shadow

Hambletonian 10

Princess 2:30

Pilot Jr.12

Jenny Lind

Sentinel 2:29 $\frac{3}{4}$

Maid of Lexington

Octoroon

Swallow

Abdallah 1

Charles Kent Mare

Ham. (Andrus)

Unknown

Canadian Pilot

Nancy Pope

Bellfounder

Unknown

Hambletonian 10

Lady Patriot

Mambrino Pilot

Brownlock

Tom Hal Jr.

Bonnie Annie

Joe Hooker 185

Daughter of

Mambrino
Amazonia

imp. Bellfounder
One Eye

Ham. (Judson's)

Unknown
Jeanne d'Arc

Funk's Havoc
Nancy Taylor

Not Traced

Abdallah 1
Charles Kent Mare

Young Patriot
Not Traced

Mambrino Chief
Juliet

imp. Leviathan

Tom Hal
Julia Johnson

Mambrino Chief

Sam Johnson

because he was placed in stud service on Forbes' farm, Boston. The scope of his stud career at Forbes' farm was limited as the best trotting mares were bred to Bingen 2:06 $\frac{1}{4}$. As a nine-year-old he was sold to W. E. D. Stokes of New York City, who sent him to the Patchen Wilkes' farm of Lexington, Kentucky, at which time he had only one performer in the list. Here, where he still remains, he was placed in active stud service and bred to the best of mares.

Up to the present time, Peter the Great is the sire of 231 standard performers. He has sired twenty-six stallions, whose get numbers 106 standard performers, and eighteen dams, whose produce numbers twenty-two standard performers. He has sired forty 2:10 performers of which thirty-five are 2:10 trotters, which is five more than the combined 2:10 trotting get of the next two ranking sires. Twenty-six of these trotters entered the 2:10 list during the years 1911 to 1915 inclusive. Eight entered the 2:10 list during the season 1915, which is four more than the number credited to any other one sire during one season. He is the sire of seventeen 2:10 stallions, which is more than the total 2:10 trotters of all sexes gotten by any other sire.

Peter the Great has been one of the leading sires of performers during the last six years. As the sire of new standard performers by years, he ranks second in 1910, with twenty-two; second in 1911, with eighteen; second in

1912, with twenty-one; second in 1913, with twenty-one first in 1914, with forty-six; and first in 1915, with sixty.

Peter the Great has headed the list of winning sires for the last six years. He has sired the winners of over 600 public races which races were worth nearly \$450,000.00. In 1914, his get won \$128,000.00. He has sired the winner of the largest amount of money ever won by a harness race horse in regular events in a single season. Peter Scott 2:05 $\frac{1}{4}$ was the winner of \$50,535.00 during the campaign of 1915. He has also sired the three-year-old winning the most money in history. Peter Volo, in 1914, won \$35,500.00.

Peter the Great is not only a sire of winning horses, but he is also a sire of sires. Some of his sons are now in active stud service, and the service fee of each follows: Peter Volo 2:02, \$200.00; Peter O'Donna, 2:08, and Robert C. 2:09 $\frac{3}{4}$, \$100.00; and Peter III 2:18 $\frac{1}{4}$, \$25.00.

At twenty-one years of age Peter the Great was sold by W. E. D. Stockes to S. J. Fletcher, Indianapolis, Indiana, for the sum of \$50,000.00. This is the highest price ever paid for a horse of this age, and only four other horses have sold for prices exceeding this. He is now in the stud at Patchen Wilkes' farm, and is being stood for a service fee of \$400.00. Forty mares have been guaranteed to him this season.

Bingen 2:06 $\frac{1}{4}$

Bingen 2:06 $\frac{1}{4}$, the leading grandsire of 2:10 trotters

May King 2:21 1/2

Electioneer 125

May Queen 2:20

Young Jim 2009

Young Miss

Miss Mambrino

Hambletonian 10

Green Mountain Maid

Norman 25

Jenny

George Wilkes 2:22

Lear Mare

Red Wilkes 1749

Miss Clark

Abdallah 1

Charles Kent Mare

Harry Clay 45

Shanghai Mary

Morse Horse 6

Daughter of

Arabian

Daughter of

Hambletonian 10

Dolly Spanker

Sir William

Unknown

George Wilkes

Queen Dido

Alric 983

Kate

Mambrino

Amazonia

imp. Bellfounder

One Eye

C.M. Clay Jr. 20

Unknown

Unknown

European

Beck

Magnum Bonum

Mokhladi

Davy Crockett

Abdallah 1

Charles Kent Mare

Unknown

Unknown

Sir Charles

Hambletonian 10

Dolly Spanker

Mambrino Chief

Almont 33

Queen Lizzie

Clark Chief 89

Lida

(Figure 5)

here studied, bred by A. Smith McCann of Lexington, Kentucky, was foaled in 1893, the property of David Bennett, Lexington, Kentucky. His sire was May King 2:21 $\frac{1}{2}$, the son of Electioneer 125, and his dam was Young Miss, a daughter of Young Jim 2009, by George Wilkes 2:22. A more extended pedigree of Bingen is given in Figure 5.

Bingen 2:06 $\frac{1}{4}$ is the greatest sire of the Electioneer family, and is the only son of May King 2:21 $\frac{1}{2}$ who possessed the ability to "breed on". As a two-year-old, Bingen was sold by David Bennett to E. H. Greeley of Ellsworth, Maine, for the sum of \$1500.00. In 1895 he trotted a mile to a record of 2:12 $\frac{1}{2}$, and as a result of this record was bought by J. Malcolm Forbes for the sum of \$8,000. In 1898 at Louisville, Kentucky, Bingen made a record of 2:06 $\frac{3}{4}$. The following year, 1899, at Glenn Falls, New York, he lowered this record to 2:06 $\frac{1}{2}$. After this date he was retired from the race track, and placed in stud service at Forbes' farm, Boston, Massachusetts. Here he remained until his death in 1913.

In 1901, Bingen 2:06 $\frac{1}{4}$ had two standard performers in the list- Admiral Dewey, and Bingen Junior. At present he has 204 standard performers in the list. He has sired forty-two stallions whose get totals 617 standard performers, and thirty-six dams whose produce totals fifty-eight. Although the total number of standard performers is less than that of Peter the Great, his influence through his sons has been more than twice

as great. Some of the leading sons of Bingen 2:06 $\frac{1}{4}$ are Todd 2:14 $\frac{3}{4}$, Bingen 34707, Admiral Dewey 2:04 $\frac{3}{4}$, and Albingen 2:18. Todd 2:14 $\frac{3}{4}$, and Bingara 34707 rank among the ten leading sires of 2:10 trotters here studied.

As the leading sire of new standard performers for the last six years, Bingen ranks first in 1910, with twenty-nine; fifth in 1911, with sixteen; sixth in 1912, with thirteen; sixth in 1913, with fourteen; second in 1914, with twenty-six; and third in 1915, with twenty-seven.

It will be noticed from the foregoing data that Bingen 2:06 $\frac{1}{4}$ was not as prolific a sire of standard performers as was Peter the Great 2:07 $\frac{1}{4}$. It must be remembered, however, that Bingen's get together with his sons' get, prove him greater as a progenitor of standard performers than Peter the Great, who was his junior by two years.

As was shown in Tables 3, 4, and 5, Bingen 2:06 $\frac{1}{4}$ was the grandsire of thirty-eight 2:10 trotters—thirty-three tracing through twelve of his sons, and five through five of his daughters. Although Peter the Great was the direct sire of twenty-six 2:10 performers, Bingen 2:06 $\frac{1}{4}$ was directly responsible through his sons and daughters for thirty-eight 2:10 performers. He is also a direct sire of three 2:10 performers here studied.

It may be said that Bingen's successes as a sire are due to the fact that he was given a better chance in the

stud than Peter the Great 2:07 $\frac{1}{4}$, that is, up to 1905. Since then Peter the Great's opportunities in the stud have been equally as good as those of Bingen 2:06 $\frac{1}{4}$; but as yet his offspring have not arrived at the age to demonstrate their sire's ability as a progenitor of trotters.

George Wilkes 2:22

George Wilkes 2:22, the leading great grandsire of 2:10 performers here studied, bred by Colonel Felter of Newberg, New York, was foaled in 1856. His sire was Hambletonian 10, and his dam was Dolly Spanker, whose pedigree is given as untraced. The dam died in giving birth to George Wilkes, and, as an orphan colt, he was reared on cow's milk. His pedigree, as far as is known, is given in Figure 6.

George Wilkes 2:22 was the first young stallion to enter the 2:30 list. In 1862 he trotted to a record of 2:24 $\frac{3}{4}$. Later, he became the world's champion trotting stallion by trotting in 2:22, at Providence, R.I. in 1862. He remained upon the turf until 1872, his last victory being won at the age of sixteen. In 1873 he was taken by W. L. Simmons to Lexington, Kentucky, where he remained until his death, in 1882.

George Wilkes' fame did not rest upon his turf performances. It was as a sire of great trotters that his prominence was manifested.

<u>Hambletonian 10</u>	<u>Abdallah 1</u>	<u>Mambrino</u>	<u>imp.Messenger</u>	<u>Mambrino</u>
			<u>Daughter of</u>	<u>Th'bd. Mare</u>
	<u>Charles Kent Mare</u>	<u>Amazonia</u>	<u>Son of</u>	<u>Sour Crout</u>
			<u>Unknown</u>	<u>Th'bd Mare</u>
		<u>imp.Bellfounder</u>		<u>imp.Messenger</u>
				<u>Unknown</u>
<u>Dolly Spanker</u>	<u>Unknown</u>	<u>One Eye</u>	<u>Hambletonian</u>	<u>imp.Messenger</u>
	<u>Unknown</u>		<u>Silvertail</u>	<u>Pheasant</u>
				<u>imp.Messenger</u>
				<u>Unknown</u>

(Figure 6)

He has sired eighty-three standard performers. He has sired 103 stallions, whose performing get total 3204 (2116 trotters, and 1088 pacers), 110 dams, whose performing produce totals 209 (150 trotters, and 59 pacers).

As a progenitor of performing descendants he is one of the foremost sires of American trotting history, for those horses carrying his blood far exceed in number that of any other sire, excepting Hambletonian 10. In the pedigrees of the 2:10 performers studied here, he appeared no less than 553 times. Although George Wilkes does not appear in the near ancestry of the 2:10 trotters here studied, his appearance in their remote ancestry is outstanding. Thus, he appears 100 times in the third generation in the pedigrees of the 2:10 trotters; 249 times in the fourth generation, and 204 in the fifth generation. As shown in Table 8, which includes ten leading grand-sires of sires and of dams of 2:10 performers, 15.92 per cent of the sires and dams have George Wilkes 2:22 as their progenitor.

Electioneer 125

Electioneer 125, bred by Charles Backman, Stonyford, Orange County, New York, was foaled in 1868. He was sired by Hambletonian 10, and was out of Green Mountain Maid by Harry Clay 45. His second dam was Shanghai Mary, whose breeding is unknown. Electioneer's breeding on his sire's side is the same as that of George Wilkes; while on his dam's side he

<u>Hambletonian 10</u>	<u>Abdallah 1</u>	<u>Mambrino</u>	<u>imp. Messenger</u>	<u>Mambrino</u>
			<u>Thbd. Mare</u>	
		<u>Amazonia</u>	<u>Daughter of</u>	<u>Sour Crout</u>
	<u>Charles Kent Mare</u>	<u>imp. Bellfounder</u>	<u>Son of</u>	<u>Thbd. Mare</u>
		<u>One Eye</u>	<u>Unknown</u>	<u>imp. Messenger</u>
			<u>Hambletonian</u>	<u>Unknown</u>
			<u>Silvertail</u>	<u>imp. Messenger</u>
				<u>Pheasant</u>
				<u>imp. Messenger</u>
				<u>Unknown</u>
	<u>Harry Clay 45</u>	<u>C.M. Clay Jr. 20</u>	<u>C.M. Clay 18</u>	<u>Henry Clay 8</u>
		<u>Unknown</u>	<u>Daughter of</u>	<u>Jersey Kate</u>
<u>Green Mountain Maid</u>	<u>Shanghai Mary</u>	<u>Unknown</u>		<u>Chancellor</u>
		<u>Unknown</u>		
		<u>Unknown</u>		

(Figure 7)

traces to Henry Clay 8. A more extended pedigree is given in Figure 7.

Electioneer 125 was bought by Leland Stanford of California for the sum of \$12,500.00 which, at that time, was thought to be an excessive price. He was taken to Palo Alto where he died in 1890.

While in the hands of Mr. Backman he was not given a fair chance in the stud. Leland Stanford was a believer in a close thoroughbred cross, and on account of this, Electioneer 125 was bred mostly to half breed and thoroughbred mares. Nevertheless, his success in the stud in California was astounding. He has sired 160 standard performers in the list (158 trotters, and 2 pacers). He has sired 104 stallions (one more than is credited to George Wilkes) whose performing get totaled 1878 (1465 trotters and 413 pacers), and 116 dams, whose performing produce total 186 (159 trotters, and 27 pacers). It will be noticed from these data that Electioneer 125 was the sire of more sires and dams of standard performers than was George Wilkes, but their performing offspring were considerably less in number. This was probably due to the fact that the sons and daughters of George Wilkes 2:22 were given a better opportunity than that of Electioneer 125- a better class of American trotters being available in the East than in the West.

It is to be noted that Electioneer 125 is the only prominent son of Hambletonian 10 appearing in the second generation of the 2:10 trotters here studied. He is the grandsire of twelve 2:10 trotters. His appearance in the other generations of the 2:10 trotters here studied is nevertheless noteworthy. These 2:10 trotters trace 187 times to Hambletonian 10 through Electioneer 125.

Hambletonian 10

Hambletonian 10, the greatest progenitor of American trotters, bred by Jonas Seely, Sugar loaf, Orange County, New York, was foaled in 1849. His sire was Abdallah, and his dam was the Charles Kent Mare a daughter of Imported Bellfounder. A study of his pedigree, as shown in Figure 8, shows that he has four crosses of Imported Messenger in his ancestry.

In 1849, Hambletonian 10 with his dam, the Charles Kent Mare, was sold for the sum of \$125.00 to William M. Rysdyk, Chester, Orange County, New York, in whose ownership he remained until his death, in 1876.

In 1851, Hambletonian 10 began active stud service, which, with the exception of one year (1868), he continued until 1872. During the twenty-one years of service he sired 1287 foals, the service fees for which amounted to \$185,715.00. He has sired forty standard performers in the list. He has

Abdallah 1

Mambrino

imp. Messenger

Mambrino

Turf

Thbd. Mare

Untraced

Daughter of

Sour Crout

Thbd. Mare

Son of

imp. Messenger

Mambrino

Thbd. Mare

Unknown

Amazonia

Unknown

imp. Bellfounder

Charles Kent Mare

Hambletonian

imp. Messenger

Mambrino

Thbd. Mare

Pheasant

Shark

Thbd. Mare

One Eye

imp. Messenger

Mambrino

Thbd. Mare

Silvertail

Unknown

(Figure 8)

sired 150 stallions, whose performing get total 1717 (1493 trotters, and 224 pacers), and eighty dams, whose performing produce totaled 119 (111 trotters, and 8 pacers).

According to Frank E. Best, Registrar of the American Trotting Register Association, Hambletonian 10 is the progenitor of over ninety per cent of all American trotters recorded. In this thesis, a study of the top male line sires shows that 300 of the 314 2:10 trotters here studied trace to Hambletonian 10. A further study of these 2:10 trotters shows that Hambletonian 10 appeared 1027 times in the first five generations of these trotters, and an additional 315 in the sixth generation through his two sons, George Wilkes 2:22, and Electioneer 125. Hambletonian 10, as the founder of the family bearing his name has been one of the most potent factors in the production of American trotters.

VII SUGGESTIONS FOR FUTURE STUDY

Any work to be complete must contain all information possible pertaining to the work. So it is with a study of bloodlines which have produced 2:10 trotters. First, all the 2:10 trotters in the list must be included in the study and second all information pertaining to them must be obtained.

The complete list of 2:10 trotters is made available in "Wallace's Yearbook". Most of the literature concerning 2:10 trotters is published in the horse journals. However, this literature cannot always be taken as authentic.

In a study of bloodlines which have produced 2:10 trotters, it becomes necessary to trace the pedigrees of the 2:10 performers. An extended pedigree should be made and this pedigree should contain at least five generations of ancestors and as many more as can be had.

A reasonably satisfactory method for studying the pedigrees is to study them by generations. The sires and dams of each generation should be listed alphabetically. By doing this all horses appearing more than once may be listed together. In the second, third, fourth and fifth generation it is necessary to make three alphabetical lists of the sires and dams. The first list should contain the paternal and maternal sires and dams, the second list should

contain the maternal sires and dams and the third list should contain the paternal and maternal sires and dams. In this way it would be possible to determine the horses that were most influential in the paternal line, the horses that were most influential in the maternal line and the horses that were most influential in both lines when considered together.

The bloodlines of each generation should be summarized and a final summary should be made of the bloodlines of all generations.

Since the 2:10 performers represent the meritorious individuals of the American trotting horse, it is advisable to incorporate within the pedigrees, records of the performers in those pedigrees. These should also be studied by generations and a final summary should be made.

SUMMARY

This summary is limited to the study of the three hundred and fourteen trotters entering the 2:10 list during the years 1911-1915, inclusive.

The three hundred and fourteen 2:10 trotters were sired by 184 stallions and produced by 299 dams.

The stallions with records of 2:10 or better, either at the trot or pace, were the most prominent in the production of 2:10 trotters. Each 2:10 stallion sired an average of 2.5-progeny.

The stallions with no records ranked second in the production of 2:10 trotters. Each no record stallion sired an average of 1.83 $\frac{1}{2}$ progeny.

The stallions with records of 2:30 or better trotting, or 2:25 or better pacing, had the poorest results as producers of 2:10 trotters. Each stallion sired an average of 1.44 $\frac{1}{2}$ progeny.

Peter the Great 2:07 $\frac{1}{4}$ stands out, pre-eminently, as the greatest direct sire of 2:10 trotters. In this list he has twenty-six 2:10 trotters which is three times as many as has the next ranking sire.

Bingen 2:06 $\frac{1}{4}$ is the greatest grandsire of 2:10 trotters. He is the sire of twelve sons and five daughters which sired and produced thirty-eight 2:10 trotters, respectively.

George Wilkes 2:22 is the greatest great grandsire of 2:10 trotters. He has twelve sons and four daughters which are the sires or dams of fifty-six sires of 2:10 trotters. He has fourteen sons and one daughter which are the male or female parents of forty-four dams of 2:10 trotters. Thus, one hundred sires and dams of 2:10 trotters have George Wilkes 2:22 as their grandsire.

The leading families tracing to the "top sires" that appeared in the pedigrees of the 2:10 trotters are George Wilkes, the Electioneer, and the Happy Medium, ranking in the order named.

The six sires appearing the greatest number of times in the pedigrees of the 2:10 trotters are Hambletonian 10, Mambrino Chief 11, Pilot Jr. 12, George Wilkes 2:22, Electioneer 125, and Mambrino Patchen 58.

Hambletonian 10, Mambrino Chief 11 and Pilot Jr. 12, three of the sires appearing the greatest number of times in the pedigrees of the 2:10 trotters, are founders of families bearing their names.

Hambletonian 10 appears 1027 times in the pedigrees of the first five generations of the ancestors of 2:10 trotters. Through his sons, George Wilkes 2:22 and Electioneer 125, he appears an additional 315 times in the sixth generation.

Mambrino Chief 11 appears 355 times in the pedigrees of the first five generations of the ancestors of 2:10 trotters. Through his son Mambrino Patchen 58, he appears an additional

320 times in the sixth generation.

Pilot Jr. 12 appears 119 times in the pedigrees of the first five generations of the ancestors of 2:10 trotters.

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UNIVERSITY OF MISSOURI
COLUMBIA

COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATION
DEPARTMENT OF VETERINARY SCIENCE

May 22, 1916.

Dean Walter Miller,
Chairman, Graduate Committee.

Dear Dean Miller:

I have read the dissertation of Mr. W. L. Stangle, under title of: "A Study of Blood Lines which have Produced 2:10 Trotters," and I join with Prof. E. A. Trowbridge in approval of same for partial fulfillment of the requirements for the degree of Master of Arts.

It is a valuable collection of data, well classified and tabulated, to show the ancestral sources of the present day fast trotters. It is in a way a qualitative and quantitative analysis or comparison of the contribution of the several great sires to the present day trotting speed. The dissertation is a contribution of scientific and practical value to students of horse breeding.

Very truly,

J. W. Trowbridge

University of Missouri - Columbia

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