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SPECTACLE AND ILLUSION:
THE MECHANICS OF THE HORSE RACE ON THE THEATRICAL STAGE
1883 - 1923

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By
Donald F. Recklies, A.B., M.A.

* * * * *

The Ohio State University
1984

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In the English speaking world the nineteenth century saw the flourishing of a technologically sophisticated, mercantile society, a society enriched by the continuing fruition of the industrial revolution in an environment of accessible resources and markets. Metropolitan areas burgeoned. The twin magnets of freedom from old social restraints and the availability of jobs in commerce and industry drew an enormous influx to working class urban neighborhoods near metropolitan districts. Rapid expansion of mass transit facilities in the latter part of the nineteenth century further eased movement to and from metropolitan areas.

London and New York were the preeminent, swelling métropoles of the nineteenth century, however, they shared their growth with other commercial centers. Whereas in the English speaking world London alone held a population of over 100,000 in 1801, by 1901 she shared that distinction with forty-eight other U. K. cities, and herself had grown to a population exceeding 4,500,000.\(^1\) New York did not achieve

\(^1\) J. A. Banks, "The Contagion of Numbers," in The Victorian City, ed. H. J. Dyos and Michael Wolff (London:
a population of 100,000 until after 1810; but by 1900 her population was over 3,000,000, and thirty-seven other U. S. cities had populations exceeding 100,000. The greatest part of this vast increase consisted of the working masses, among them a relatively affluent lower middle class, a class with new found leisure and wealth enough to enable development of a popular culture.

As wages rose and working hours lessened, these masses increasingly needed to be entertained. Self-improvement societies and devotional meetings swelled and, from mid-century, temperance societies flourished. Preeminent among the diverting pastimes were theatricals: penny gaffs.


3 The penny gaffs were low-class, theatrical ventures that flourished in the most populated areas of nineteenth century London and were frequented mainly by lower working-class adolescents. Their programs were primarily melodramatic entertainments, not above an hour in length, which were frequently changed and which were mounted on casually constructed stages with a minimum of scenic accessories. The program, usually two twenty minute plays divided by a comic musical interlude, could be repeated as many as five or six times a night. Looked upon with disfavor by authorities, the gaffs were nonetheless a theatrical initiation for much of the middle class London audience. An account based upon nineteenth century sources is Paul Sheridan's Penny Theatres of Victorian London (London: Dobson Books, Ltd., 1981).
music halls, and legitimate theatres. In these latter places of entertainment both the values and technology of Victorian society were reflected. Following the abolition of privilege in 1843, which removed the monopoly on spoken drama enjoyed by the patent theatres in London, innumerable theatres began presentation of stirring melodramas which espoused a middle class morality and which were embellished with scenery and effects that, especially in larger, more affluent theatres, stretched the capability of traditional stagecraft.

The popular theatre adopted the most useful and immediately employable fruits of the industrial revolution. Both gas and electricity were employed to light theatres soon after their introduction as a lighting medium, and both found early employment in a variety of stage effects. The employment of steam and electrically driven machinery, however, was somewhat tardy, the counterweight and man-powered machinery that was a legacy from the Italian and French stage being adequate to most theatrical needs. It was not until the second half of the nineteenth century that steam and hydraulic machinery began to find employment on the English speaking stage, and the introduction of

4 Although the old Opera House, Vienna, employed steam power to actuate its stage traps, large scale mechanization of the modern stage depended upon hydraulic power. The first large scale employment of hydraulic machinery in the theatre in the United States was at Booth's Theatre, New York (1869-1883), where hydraulic rams supplied from cisterns on the roof actuated bridges and traps by means of
The employment of complicated rigging and machinery was most evident in the effects prepared for the pantomime and for the almost obligatory sensation scenes of many nineteenth-century melodramas. From early in the century many English theatres vied for audiences with such difficult to stage spectacles as maritime accidents, fiery holocausts, and various natural disasters such as earthquakes, floods, and even volcanoes. Isaac Pocock's venerable melodrama The Miller and His Men (1813) concluded with a violent explosion of the bandit's mill, and the opera Masaniello (1827) depicted an animated eruption of Mt. Vesuvius, a popular scene which was executed throughout the century. Burning a steel cable drive. This substantial and complex theatre machinery was most atypical, being very advanced for its time. The use of hydraulic power for fire curtain lifts in "safety theatres" had become common by the turn of the century, and major theatres were then installing both electric and hydraulic machinery. The Asphaleia system of direct acting hydraulic rams for stage lifts (Buda-Pest Opera House, 1881) was employed on a large scale in the Auditorium Building, Chicago (1889), and at the Lyric Theatre, London (1888). Loren Hufstetler, "A Physical Description of Booth's Theatre, New York, 1869-1883," Theatre Design and Technology, 43 (1976), 8-18 & 38; Richard Leacroft, The Development of the English Playhouse (London: Eyre Methuen, 1973), pp. 276-9; and William C. Young, Documents of American Theatre History (Chicago: American Library Association, 1973), II, 296-98.

buildings, epitomized by Boucicault's *The Poor of New York* [in England transformed to *The Streets of London* (1864)] were a stock spectacular hazard, and foundering ships frequently made their appearance. A similar emphasis on spectacular theatre obtained in the United States, although here the trend lagged that of the English stage and tended more toward extravaganza than spectacular scenic effects. Nevertheless, many New York theatres became noteworthy for their displays of spectacular effects.

Throughout the century legitimate drama and melodrama turned toward an increasing picturization of urban life and that of the well-to-do. As it became apparent that representations of local color aided in drawing an audience, recognizable locales were emphasized, and their popularity corresponded with the degree to which they matched locales familiar to their audience. Urban scenes abounded; municipal monuments and industrial scenes proliferated, the latter often animated with appropriate machinery. Production of the illusions of burning buildings, moving trains, and operating machinery became a complex craft. Even when locales were entirely ficticious, frequently scenes were mounted to create an aura of detailed, solid verisimilitude. The standard complement of two dimensional

---

wing and drop settings that served the actor-oriented, lamp-lit theatres of the eighteenth century became a mark of provincial, old-fashioned staging in the latter nineteenth century. Illusionism was replaced by picturization, and the theatre of words became the theatre of action and spectacle.

The nineteenth century thus saw the development of parallel trends towards meticulous representation and spectacular effect, trends often uneasily married. The Drury Lane autumn dramas of the Augustus Harris and Arthur Collins managements are notable examples of this development. Here the melodramatic need for spectacle and the contemporary fashion of cumbersome verisimilitude clashed in ponderous dramas in which the mounting of scenery and effects, even on the extensively mechanized Drury Lane stage, often excessively prolonged performances and took equal billing with the actors. These performances were visual extravaganzas, and it did not escape notice that plot and dialog frequently were not handled with the same facility as the scenery.

In retrospect, it is difficult to discern how much of the attraction of these spectacular scenes was due to an

---

7 For many years it was the custom of the Drury Lane management to mount a spectacular melodrama for the opening of the theatrical season in autumn. These were invariably luxuriously mounted, with numerous built-up, realistic scenes and lavish costumes, and the term "autumn drama" became almost proprietary to these Drury Lane entertainments.
appreciation of their display of sheer technical virtuosity. It is certain that the scenic wonders of the 1870's and before generally found less favor in the 1890's, although whether the expectations of the audience had changed or whether other factors such as improvements in lighting made scenic deficiencies more evident and annoying is, perhaps, moot. A well executed effect, however, maintained its drawing power. The volcano effect, introduced with acclaim in 1827, could still be greeted with approbation in Paris and New York in 1912. After the turn of the century it was evident that cinema easily surpassed the capabilities of the stage in versatility, magnitude, and verisimilitude of spectacle, yet entertainments such as the Drury Lane autumn melodramas continued to inspire wonder with their sensation scenes. In both England and the United States much of this wonder must have been simple awe that anyone could have the temerity to produce such scenes live on stage, as was certainly the case with the staged sandstorm scene of The Garden of Allah at the Century Theatre, New York (1911).


9 The Garden of Allah was produced both in New York and later at Drury Lane in 1920 as the inaugural event of the Arthur Collins management. MacQueen Pope recounts an amusing anecdote that on opening night a gauze curtain separating the stage and auditorium, which was used in all
In this drama, as in others of its type, spectacular views were piled upon sensational effects. The Hope, the Drury Lane autumn drama of 1911, displayed local color scenes of Oxford, the Indian Service, and elegant scenes of country estates. Spectacular scenes, prominently noted in red in the program, included a Vice-Regal ball at Delhi (Fig. 1), an earthquake and fire in an Italian town (Fig. 2), and the Derby at Epsom Downs, staged complete with live horses running on stage in view of the audience.10

The Derby scene in The Hope employed a mechanism which had been perfected in the United States at the end of the nineteenth century. This device was a racing machine which combined treadmills and moving panoramas to simulate a horse race within the confines of the proscenium stage, a mechanism most familiar for its employment in the sensational chariot race scene in William Young's dramatization of Ben-Hur. In this device, well known in the dress rehearsals, was omitted, and that the inhabitants of the stalls were inundated with clouds of pea-flour. The realistic sand-storm effect in The Garden of Allah, however, was predated by a similar effect in Belasco's Under Two Flags (1901). Belasco's storm employed machine blown fuller's earth in conjunction with stereopticon cloud effects and an animated bending palm which enhanced the effect of strong wind. W. H. MacQueen Pope, Theatre-Royal Drury Lane (London: W. H. Allen & Co., Ltd., 1945), pp. 304-5; and Wendell Phillips Dodge, "Staging a Sandstorm," Theatre Magazine, 15, No. 131 (1912), 15-16 & viii.

Fig. 1  The Vice-Regal ball at Delhi in *The Hope*

Fig. 1  The Vice-Regal ball at Delhi in *The Hope*
Fig. 2 Earthquake and fire scene in *The Hope*

Fig. 2 Earthquake and fire scene in The Hope
principle, the horses were rigged to run in place upon treadmills while the surrounding animated scenery gave the impression of swift progress across the ground.

In recent years, concurrent with a reevaluation of much Victorian and Edwardian drama, interest has risen in the mechanics of staging sensational effects such as the Derby race scene. It seems, however, that those involved in the staging of celebrated sensation scenes seldom had reason to disseminate detailed information about the mechanisms employed. Descriptions of these effects may be gleaned occasionally from prompt books and published script notes, and from the often less-than-accurate observations of drama reviewers, but specific technical data about the machinery utilized are rare, although information sometimes appears in such journals as The Electrical World and Scientific American. Because of the nature of the theatrical machinist's craft, generally that of busy, practical, non-literary men dealing with specialized, ephemeral mechanisms, many of these devices may never have been recorded in a manner that merited preservation. Therefore, although many spectacular stage effects from the nineteenth century are known generally, specific information regarding the mechanics of the effects is lacking or is scattered in disparate sources.

The object of this dissertation is to examine and describe the mechanisms of one of these effects, that of the
staged horse race as it was presented upon the English and American stage, and to elucidate the origins and evolution of the machinery employed to effect the illusion. Where it is pertinent, reference will be made to antecedent machinery germane to staging the effect. Comparisons will be drawn between the various mechanisms employed, and their gradual improvement will be noted. Although critical response to the illusion and staging will be recognized, and the nature of audience response to the illusion may be noted, emphasis will be placed upon the mechanical development of the effect machinery.
CHAPTER I

UNASSEMBLED COMPONENTS

Although horse racing machines are relatively recent theatrical phenomena, the use on stage of their essential components, moving panoramas and treadmills, much predated their employment in the stage racing machines of the latter nineteenth century. The moving panorama first appeared on stage as a simple moving picture, an animated cousin of the static panoramas and dioramas that had become popular at the end of the eighteenth century. In the United States, the moving panorama appeared as early as 1828 at the Park Theatre, New York. In London, its earliest manifestation may have occurred in 1819 at Spring Gardens (later Vauxhall Gardens), where "Marshall's Grand Historical Peristrephic PANO-RAMA" displayed the coronation ceremonies of George IV on over 10,000 square feet of canvas, or perhaps as early as 1802 in Egyptian, produced by Mark Lonsdale in the upper

1 At the Park Theatre, Paris and London, or a Trip to Both Cities used "somewhat elaborate dioramic scenery . . . representing a trip from Calais to Dover--the scenery moving, the boat deck still" which Odell notes was at that time being "render[ed] very popular in London." George C. D. Odell, Annals of the New York Stage (New York: Columbia Univ. Press, 1928), III, 320 & 378.
room of the Lyceum. These early panoramas were presented as spectacles in themselves, not as adjuncts to the drama. They frequently depicted the scenes of famous battles or, much like a travelogue film, a series of views, not necessarily connected or consecutive, from some picturesque journey. They moved slowly, often pausing at scenes of special interest or for changes in illumination. The first known moving panorama integrated with stage action appeared in the Covent Garden Christmas pantomime of 1824, *Harlequin and the Dragon of Wantly*, in which in the harlequinade a boat race was backed by a view of the Thames painted by the Messrs. Grieve. Subsequently the panorama found frequent use in pantomime and increasing use in legitimate drama, often as a device to provide transition between scenes widely spaced in

2 There is no certainty about the mechanism or appearance of these animated scenes; indeed, they may not have been the familiar roller-type panorama arranged to unroll from one vertical cylinder to another, but may even have been a series of framed scenes pushed across the audience's field of view. A moving panorama similar to those later employed with the racing machines was most likely employed in the Covent Garden pantomime of 1820, *Harlequin and Friar Bacon; or The Brazen Head*, in which the moving background depicted passage across Holyhead Bay to Dublin. In *The Shows of London* Richard Altick discourses on the difficulty of identifying the various devices termed dioramas and panoramas, etc., and also describes other of Marshall's "peristrephic" spectacles. Richard Altick, *The Shows of London* (Cambridge, Mass.: Harvard Univ. Press, 1978), ch. 15; and Richard Carl Wickman, "An Evaluation of the Employment of Panoramic Scenery in the Nineteenth-Century Theatre," M. A. Thesis, The Ohio State Univ. 1961, pp. 87-89 & 176-9.

place or time. A notable instance is the passage from England to France that Clarkson Stanfield composed for Macready's production of *Henry V* (1839).

H. M. Milner's equestrian spectacle, *Mazeppa*, produced in 1831 at the Royal Amphitheatre, London, and in New York at the American Theatre in 1837, seems to have been the first drama to employ a moving panorama as a background for a moving horse. This "panorama," however, was very unlike the swiftly moving belts that would form the backgrounds of late nineteenth-century racing machines. It seems to have been composed of flats which were pushed slowly across the stage behind a ground row masking a horse which marked time much in the fashion of a circus animal stepping in place.  

Illusionistic staging of a horse race in the proscenium theatre had to await improvements in machinery late in the century. The scene, to be effective, required careful integration of sturdy devices, treadmills that could withstand pounding hooves and panoramas that could revolve.

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4 Occasionally this Royal Amphitheatre scene is described as having employed a treadmill, yet there seems to be no evidence that such a device was ever employed. Cf. Altick, p. 201 and A. H. Saxon, *Enter Foot and Horse* (New Haven, Conn.: Yale Univ. Press, 1968), pp. 175-89 passim; also see Wickman, pp. 256-7. Oliver credits *Mazeppa* at the American Theatre with being "the first integrated use of a panorama in full-length legitimate drama on the New York Stage." George Oliver, "Changing Patterns of Spectacle on the New York Stage (1850-1890)," Diss. Pennsylvania State Univ. 1956, pp. 4-5.
swiftly without jam or hitch. Means other than the use of
racing machines had been employed in an attempt to sustain
the illusion of swiftly moving horses on stage. Mazeppa was
frequently staged with model horses worked far upstage, and
Boucicault's Flying Scud (1866) employed cutout horses which
traversed the racecourse on wires. Frequently races were
staged as if they occurred offstage, a crowd of onstage
observers telegraphing the result of the race to the theatre
audience by means of their actions and cries. Such was the
method of staging The County Fair, the first play to employ
a combined panorama and treadmill to simulate a horserace,
whenever racing machines could not be employed. Where wing
space was sufficiently extensive, part of the race could be
simulated by horses galloping the short distance across the
stage, running into and out of view of the audience. This
was the method Augustus Harris employed at Drury Lane in

5 However, seventy-odd years after their introduction
to the theatre there still seemed to be difficulties with
panorama movements. Edwin Sachs complained "Why let our
beautifully-painted panoramic scenes jerk along according to
the jerky manner in which the scene-shifter handles his
drums? The panoramic scenes may cost £1,000, and yet the
simplest mechanical contrivance to ensure their smooth
working is grudged and the effect entirely spoilt." Edwin
1895, p. 207. Oliver notes that at mid-century managers in
the United States were reluctant to employ panoramas because
they "were unwieldy [sic.], seldom working anywhere near
perfection," and that the device was rarely mentioned in
advertisements until after 1850. Oliver, pp. 3-4.

6 Saxon, pp. 223-7.
A Run of Luck (1886). Needless to say, the horses were unable to attain much speed, and this latter expedient resulted in a rather truncated race which, in the later racing plays such as The Prodigal Daughter (1892), was usually fleshed out by anticipation simulated by onstage spectators. 7

It was relatively easy to arrange a run of several horses across the stage, and, by the end of the century, the use of live animals on stage, except exotic varieties, had long ceased to be novel. The ultimate spectacular achievement of the racing plays was the presentation of horses running in view for an extended period accompanied by animated scenery which enhanced the impression of speed. This effect was first accomplished with treadmill and panoramas in the 1880's, and could be duplicated in no other way until the perfection of cinema and projected scenery.

Sixty years of previous theatrical employment had produced a variety of ways to support and move large panoramic cloths and capable stage machinists who could cope with the rigging and ponderous machinery involved. The machinery of the treadmill, however, did not derive from the stage, but from the work of agricultural and factory machinists. Horse driven treadmills were frequently used to

power farm machinery in the 1870's and 1880's (Fig. 3), and large farm complexes routinely employed steam engines and belt transmissions to provide motive force at the site of portable farm machinery. Of necessity, this machinery had to be both very flexible and easy to set up.

The proliferation of integrated factories that employed large, central engines with elaborate transmissions of belting and shafting had resulted in the production of a great store of equipment from which the stage machinist could draw (Fig. 4). Furthermore, the latter part of the nineteenth century saw an increasing trend to employ individual engines to drive isolated machines, a trend made possible by the development of small, efficient electric motors. The introduction of electric motors to the stage made easy the control and coordination of complex effects requiring considerable motive power, effects such as the coordination of treadmills and rapid movement of large

Some insight to the theatrical mechanisms might be drawn from an examination of the horse-powered treadmills that were commonly employed on farms and in small factories in the 1870's and 1880's. Agriculture then employed a variety of horse-power engines including oblique treadmill mechanisms, vertical treadwheels, gin-pole devices, and inclined plane treadmills, the latter being most similar to the treadmills used upon the stage. The inclined plane treadmills were common enough to be advertised in Montgomery Ward's and Sears's agricultural catalogs, however, J. Kenneth Major's survey of existing horse-power engines includes only two horse-powered inclined plane devices, both in exhibition villages in Canada. J. Kenneth Major, *Animal Powered Engines* (London: B. T. Batsford, 1978), pp. 17, 98, & 115.
Fig. 3 Agricultural horse-power

An example of commonly employed inclined treadmills. Sears Fall Catalog No. 107, 1898.
Acme Tread Power.

Level or even tread. New pattern and up-to-date in all respects. Three sizes, one, two, and three-horse. These powers are roomy, built in the best possible manner, of the best materials obtainable, and in a style corresponding with other lines turned out at these works. The shafts and rods are all cold rolled steel. The treads are of best seasoned maple. The rollers are large. There is not a cot on any link in either style or size of these powers. We carry the treads around the front end on a reel. This plan avoids a great loss of power in the reversing of the motion or turn of the rollers in changing from the lower to upper track. This adds to the life of the power, and we earnestly request you to consider and investigate this point: besides, we save by actual demonstration ten per cent, and over of power by this plan. We double gear near the reel shaft to the drive shaft. The governor regulates the speed as perfectly as the governor on a steam engine. We will guarantee as strong, well-built powers as any other maker, and weight of teams and incline being equal, to develop as much or more power. Our hand brake, which works from either side, is not applied to the band wheel. You can therefore belt out in front or back, and the band wheel can be shifted to either side of the power. The motion is right for feed grinders, fodder cutters and shredders, wood saws and such other machines as such powers are commonly used for.

No. 86936 One-horse double gear with speed regulator...
No. 86937 Two-horse double gear with speed regulator...
No. 86938 Three-horse double gear with speed regulator...
No. 86939 One-horse not geared and without speed regulator...

Fig. 3 Agricultural horse-power
Fig. 4 Chubb & Sons, factory shafting and belting

Fig. 4 Chubb & Sons, factory shafting and belting
panoramic sheets. By the turn of the century electric motors were being employed to drive stage lifts and flying apparatus. All of these resources became available in the last quarter of the nineteenth century and were exploited by an American character actor, James W. Knell (best known by his assumed name, Neil Burgess), to assemble the first of an increasingly elaborate series of stage horse-racing machines.

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9 By the turn of the century electricity was being employed to drive large theatrical equipment. Covent Garden installed electrically operated bridges in 1900, and the Coronet Theatre and Wyndham's Theatre were employing a unified system of electrically driven flying apparatus in the first decade of the new century. Richard Leacroft, The Development of the English Playhouse (London: Eyre Methuen, 1973), pp. 281-2; and "Scene Shifting by Electricity," The Stage Year Book 1909, (London: Carson and Comerford, 1909), pp. 56-58.
CHAPTER II

THE AMERICAN MACHINES OF NEIL BURGESS

J. W. Knell, a popular American character actor who, under the stage name Neil Burgess, initially mechanized the horse race for the stage, was born in Boston, Massachusetts, in 1851. During his lifetime he was noted more for his skill as a comic character actor specializing in female roles than for his contribution to spectacular staging. Nevertheless, his most noted role was in a second-rate, bucolic melodrama, the success of which was in great part due to public acclaim of its sensational race scene.

Early in his stage career on the vaudeville and minstrel stage Burgess fortuitously fell into the line of comic old women by stepping into such a role at short notice at the Comique Theatre, Providence, Rhode Island, where he had been playing in a farce variously called "The Serious Family" or "The Quiet Family." Burgess's success in what was formerly

1 There are conflicting reports of Burgess's date of birth, several sources making this date 1846. Allen Johnson, ed., Dictionary of American Biography (New York: Charles Scribner's Sons, 1929), III, 277.

2 Burgess's stage career is said to have begun at age

26
a woman's role initiated his transition from a second-rate stock actor to a clever, although limited, performer of crotchety, old, Yankee women. Afraid of being mired in this line, he fled to New York City to work as a horsecar driver, a profession cut short by his inability to purchase a required bond. He then returned to the Comique and a series of stock female character roles.

The Yankee female role proved so fruitful that Burgess concocted a similar role by purchasing the rights and dramatizing parts of Marietta Holly's very popular Betsy Bobbitt stories. The resulting plays, little more than a series of loosely joined comic sketches united by the presence of the elderly New England farmwife who was their narrator, have little to recommend them to posterity apart from their introduction of a new staging device, a combination of treadmill and panorama used to simulate a horse and buggy ride on stage.

19 with Spaulding's Bell Ringers. Manager M. B. Leavitt, however, also claims to have first introduced Burgess to the variety stage in 1870. DAB, 276; "Neil Burgess Dead," clipping in the obituary file of the Billy Rose Theatre Collection of the New York Public Library (hereafter referred to as NYPL-ROSE], dateline N. Y. Feb. 19, handnoted [incorrectly] 1911; and M. B. Leavitt, Fifty Years in Theatrical Management (New York: Broadway Publishing Co., 1912), pp. 177-8.


4 See Appendix A for a list of plays copyrighted by Neil Burgess.
One of the earliest of these dramatic sketches, a play called **Josiah Allen's Wife** after the central character conceived by Marietta Holly, was dramatized for Neil Burgess by Olivia Lovell.\(^5\) It played irregularly under the various titles **Josiah Allen's Wife** and **My Opinions** from May 1882 to early in 1883,\(^6\) after which time it appeared as **Vim, or A Visit to Puffy Farm**, a variation of **Josiah Allen's Wife** for which Burgess assumed the credit of authorship.\(^7\) Unlike its earlier versions, **Vim** proved to be very popular, and was performed regularly from February 1883 through August 1888 and, with further modifications, was revived as **Neil**


\(^6\) *The New York Dramatic Mirror*, v.d.; see "Provincial Boston," *The New York Dramatic Mirror*, 27 May 1882, p. 8; and 20 Jan. 1883, p. 5. Note that Burgess copyrighted several titles based on Marietta Holly's works at different months in 1882. These include **Josiah Allen's Wife**, **Samantha & Betsy Bobbitt**, and **My Opinions**. Since reviews of **Josiah Allen's Wife** and **My Opinions** seem to refer to similar performances, it is possible that these titles are variations of the same script, or, more likely, that Burgess at various times incorporated material from all these different works.

\(^7\) With the appearance of **Vim**, Olivia Lovell is no longer credited as dramatist; programs, published text, and advertisements usually declare the work is 'by the author of "Widow Bedott."' **Vim** (New York: n.p., 1883), LC 72441. Burgess, however, appeared in an earlier sketch entitled **Vim** before he began to achieve widespread notice by undertaking the title role of Widow Bedott in a dramatization by Petroleum V. Nasby (R. E. Locke) of Nasby's popular *Toledo Blade* "Widow Bedott Sketches" in April, 1879, and it is likely that the latter **Vim** was an amalgamation of **Josiah Allen's Wife** and the earlier work. *The New York Dramatic Mirror*, 1 Mar. 1879, p. 3; 8 Mar. 1879, p. 3; and 12 Aug. 1879, p. 4.
Burgess' Circus in 1892.

Details of the staging of the buggy-ride scene in Josiah Allen's Wife, or of the original buggy mechanism, are not known beyond what information can be extracted from Burgess's patents (Fig. 5). Because the scenes involving machines were little more than extravagant pieces of stage business, even the published text of the more elaborated version of the play, Vim, does little more than suggest that the ride took place and that machinery was used, the buggy-ride itself being indicated only by "WHIRR" in the script.

The ride, however, rarely failed to attract critical attention as a "mirth-provoking adjunct" which gave further opportunity for Burgess's burlesque clowning, and its use appears prominently in advertising for the production, along with notices that Burgess had secured both patent rights to the mechanism and dramatic rights to Marietta Holly's stories.

The buggy-ride device, forerunner of numerous racing machines to follow, seems to have been an integral part of Josiah Allen's Wife from the beginning, and may have been

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9 Vim, or A Visit to Puffy Farm, 'by the author of "Widow Bedott"' (New York: n.p., 1883), LC 72441, p. 52.


Fig. 5 Burgess's buggy-ride machine, U. S. patent 256,007

The first of Burgess's treadmill-panorama patents. The groundrows (f) have been cut away to show the treadmill apparatus. Note the stay line (i) which tethers the buggy and horse on the treadmill. The patent description notes that "the motion of the endless path can be made to give the movement to the panoramic screen through suitable [unspecified] means."
F. 5 Burgess's buggy-ride machine, U. S. patent 256,007
the saving feature of the performance. The Chicago Tribune, which characterized the play as having been "put together with a pitchfork," was not alone in being more favorably inclined to the horse and machine than to the script and performers:

But the best feature on the performance, and the only one possessing the merit of originality and freshness, is the "Burgess revolving-stage horse-racing invention," by which, on the boat-rowed, moving panorama principle, the appearance of rapid movement is given to a live horse which seems to trot at good speed upon a revolving stage that leaves it stationary. The animal is a remarkably fine one, and performs with an intelligence and spirit which the more intellectual portion of the company might do worse than emulate.

The script and Chicago performance must have been very rough indeed, because Burgess's performances were normally commended, even by reviewers who otherwise had severe reservations about the propriety of female impersonation and Burgess's employment of questionable double-entendres. In


13 Throughout Burgess's early career, reviewers were often ambivalent about his subject matter and performance style. Although most reviews found Burgess's female impersonations particularly humorous and recognized him to be the leader in this line, occasionally some took offense, finding female impersonations tasteless and complaining that the performances lent themselves to indelicate suggestion. The New York Dramatic Mirror, 27 May 1882, p. 4; 18 Nov. 1882, p. 4; and "Theatres and Concerts." Boston Evening Transcript, 4 April 1892, p. 5, col. 2. It was all a matter of taste, however. The Philadelphia Inquirer, which criticized Burgess for currying favor with "coarse and indelicate attitudes, illusions and suggestions" in The County Fair, also took him to task when he used the occasion
a review of the same Chicago engagement, the *New York Dramatic Mirror* warned:

Neil Burgess has been occupying the boards . . . with an awful thing called *My Opinions*; or Josiah Allen's Wife. It is my opinion, and also of the majority of the public, that it is the worst parody on a play that has ever been seen in the city, and the empty seats night after night prove that we know a bad show when we see it. Neil Burgess, as an impersonator of eccentric female characters, is good; but he must find something else than *My Opinions* as a vehicle for his talents or loose,[sic] all he has gained in former seasons.14

Burgess must have continued to improve and expand the sketch, because reviews soon became more favorable. Detroit, the next large city on Burgess's tour, gave the play a favorable reception despite mechanical hitches with the racing machine which caused postponement of the opening performance.15 The play concerned the events of a country picnic followed by a wild buggy-ride home. One can assume that the buggy scene was used to conclude the performance both in accordance with the dictum of saving the best for last--further sketches would have been anticlimactic--and of a hymn in the first act of that play to perform a bit of foolery; the *Baltimore Sun* reported that this same scene "convulsed the audience." "'The County Fair' at the Walnut," the *Philadelphia Inquirer*, 9 Oct. 1888, p. 3; and "Ford's Opera House," the *Baltimore Sun*, 29 Oct. 1889, p. 2.


because setting and striking the machinery earlier might have hindered the performance and required the addition of olio scenes in order to cover the change of scenery and machinery. Having the treadmill device available, however, must have suggested further possibilities for stage business, and the device was soon introduced earlier in the script.

Early in 1883 Josiah Allen's Wife was altered to incorporate the visit of a circus, and the last act was expanded to display several circus scenes. In the last act, Josiah Allen, having over-indulged during the picnic, fell asleep in front of the circus tent. The scene was changed, foreground tents and a barker's booth drawn to the sides, and the tent interior was revealed. In a comic nightmare scene which followed, Samantha Allen, the character played by Burgess, appeared as a circus bareback rider who entered and mounted a stationary horse. When the horse began to move, the audience became aware that it was mounted upon a treadmill. The scene was closed by a return to the tent exterior, while upstage the scenery was changed and the buggy brought in for the ride home.16 There seems to be no description of the initial machinery used for the circus scene, or for the buggy-ride scene, but their structure can be deduced from patents granted to Burgess in 1909 and

The final elaboration of the play utilizing the buggy-ride machine and bareback riding act apparatus was *Vim, or A Visit to Puffy Farm*. In *Vim*, a melodramatic spine was inserted into the sketch by the addition of a plot in which an impostor attempts to gain and sell to the covetous Josiah title to a neighboring farm which the Puffys, as Josiah and Samantha Allen are now called, hold in trust for their ward, Mattie, and her missing brother, Fred. The sale is fortuitously foiled when Josiah bumbles an attempt to deceive his wife, Tryphena, who adamantly opposes purchasing the farm, by hiding bonds necessary for the purchase in a sack of beans. Tryphena generously gives a portion of the beans to an indigent neighbor, thus preventing the farm's transfer until Fred, who has been present incognito all the while, chooses to reveal himself.

These events, which occupied all of the first two acts and part of the third, were followed by the country circus and picnic, and concluded by Josiah and Tryphena's wild ride home. Several years later the circus episode was expanded


18 The *Boston Evening Transcript*, however, notes that Mrs. Puffy's ride could well have been eliminated, and that the play concludes with something called "The Devil's Chase," an "uncommon affair, a nightmare" in which the treadmill again does duty. Mrs. Puffy's ride could refer to
to become the main event, borrowing acts from several legitimate circuses, and the play was revived to compete with *The Country Circus*, another popular circus stage show. This entertainment, first appearing in Boston in 1892 as a substitute for Burgess's *The County Fair* when it began to flag in popularity, was titled *Neil Burgess' Circus*, but was recognizably a revamping of *Vim*. The circus play did not achieve success, and *The County Fair*,

Burgess's burlesque bareback sequence, and "The Devil's Chase" to the buggy-ride home, but the title and review could also refer to a new addition to Josiah's dream. "Theatres and Concerts," *Boston Evening Transcript*, 4 Apr. 1892, p. 5.

19 Acts included Colonel Daniel E. Boone and Mille. Carlotta's lions from Forepaugh's Circus, Girard Leon and his donkeys from Sells Brothers' Circus, and Auray's Imperial Japanese troupe and Judge Brothers Acrobats from Barnum and Bailey's Circus. Also from Barnum and Bailey's was the equestrienne, Miss Lilian Meers. The *Boston Evening Transcript* noted that neither the horse nor Miss Meers was at ease in the bareback act, the horse finding difficulty in keeping his footing and Miss Meers showing some fear, but supposed that time would accustom them both to the mechanism. "Theatres and Concerts," 4 Apr. 1892, p. 5; and "Neil Burgess Circus," *The New York Dramatic Mirror*, 9 April 1892, p. 6.

20 *The Country Circus*, interestingly enough, was partially written by Charles Barnard, Burgess's writer for *The County Fair* and *The Year One*, and was managed by Jefferson, Klaw and Erlanger, who were later to manage one of *The County Fair* companies. *The Country Circus*, which frequently played the same towns as *Neil Burgess' Country Circus*—indeed sometimes in the same weeks—also featured a circus parade and ring performances by equestrians and acrobats. Eugene Tompkins, *The History of the Boston Theatre 1854-1901* (Boston: Houghton Mifflin Co., 1908), p. 394; "In Other Cities," *The New York Dramatic Mirror*, 2 April 1892, p. 9, col. 1; and advertisement in *The New York Dramatic Mirror*, 29 Aug. 1891, p. 8.
which had been relegated to Wednesday matinee performances, was subsequently resurrected.21

Burgess's treadmill and panorama mechanisms first found application as a device for simulating a horse race upon the stage in The County Fair, a bucolic, New England melodrama written by Burgess and the prolific popular science writer Charles Barnard.22 Burgess's machines figured prominently in the success of The County Fair, which, during a period of increasingly long runs, became one of the longest running shows in New York City.

The County Fair made its first appearance in autumn of 1888, probably in Philadelphia at the Walnut Street Theatre.23 It began a long New York run as the inaugural production at Proctor's new Twenty-third-Street theatre in March 1889, and began an even longer run at the Union Square

21 "Theatres and Concerts," Boston Evening Transcript, 4 Apr. 1892, p. 5; and "Local Announcements," Boston Evening Transcript, 30 Mar. 1892, p. 4.

22 Charles Barnard was both a playwright and an accomplished writer on gardening and technical subjects. He edited "The World's Work" in Scribner's Monthly for nine years, and authored or co-authored numerous books including Light (1877), First Steps in Electricity (1888), and Tools and Machines (1903). An advertisement in The New York Dramatic Mirror, 29 Aug. 1891, p. 8, declared that Barnard was "prepared to design for managers novel scientific stage effects, and to examine plays . . . with a view to suggestions for plots, scenery, business and characters." The Dictionary of American Biography seems to imply that Barnard may have been in some way involved with the racing mechanism for The County Fair. "Barnard, Charles," DAB (New York: Charles Scribner's Sons, 1929), II, 615-6.

Theatre beginning 11 November 1889, where it played, with minor excursions, for that and the season following. Although the script was slight, depending as did *Vim* upon Burgess's popularity and the sensation created by the effects machinery, the play proved surprisingly durable. Companies touring throughout the United States may be traced in *The New York Dramatic Mirror* consistently until June 1895, and at one time there were two companies on the road under the management of Charles Jefferson while Burgess himself was playing long single engagements in another. In 1897 the play appeared in the United Kingdom: at the Opera House, Brixton, on 12 April 1897; in Glasgow in May; and in London at the Princess' Theatre in June. By most accounts, however, the play and Burgess's burlesquing did not find favor with London audiences.

27 Such is the evaluation of Burgess's English venture in most American biographies; English reviews of *The County Fair*, however, with few exceptions seem to have been favorable. C.f. "Neil Burgess Dead;" *DAB*, III, 277; "Princess' Theatre," *The Entr'Acte*, 12 June 1897, p. 7; "The County Fair," *Sunday Times*, 6 June 1897, p. 5, col. 6; and ""The County Fair;" at the Princess's,' *The Sketch*, 16 June 1897, p. 329.
The success of The County Fair was due largely to Burgess's portrayal of Aunt Abigail Prue, to the local flavor of its melodramatic plot, and particularly to the spectacle of its race scene, which was described as "a capital bit of stage mechanism," "one of the most stirring pieces of stage realism and ingenuity ever seen in this country," and "the greatest triumph of stage realism ever presented to the play-going public of New England." The spectacle of the race was bolstered by further realistic touches of local color including a barnyard scene with husking bee and barnyard animals including a live cow—"removed from view," wrote The New York Times, "before she had damaged the scenery"—milked on stage.

The plot of The County Fair is unexceptional. The central figure, played by Burgess, is an acerbic, motherly, middle-aged New England spinster, Abigail Prue, who has been courted for fourteen years by a bashful suitor, phlegmatic Otis Tucker. Solon Hammerhead, a villainous neighbor, holds a mortgage on Abigail's farm and threatens foreclosure if she will not consent to marry him. Abigail and her farm are saved through the intervention of Tim, a young vagabond


(secretly a long lost relation) whom she has befriended and who, unbeknownst to her, trains Cold Molasses, her carriage horse, and successfully rides him to win a substantial purse at the local fair. The play's scenic embellishments proved noteworthy, but the crowning spectacle was the horse race on treadmills in the last act.

Neil Burgess had been developing treadmill devices as early as 1882, when he registered a patent for a machine employing a treadmill with a panoramic background.30 A series of thirteen more patents secured during the next twenty-nine years, nine of them directly related to the horse-racing and bareback riding act machines, elaborated the devices and registered refinements such as connecting drives, treadmill brakes, and mechanisms to adjust the positions of the horses on the treadmill.31 Several of

30 U. S. patent 256,007, granted to Neil Burgess 4 April 1882, probably represents a prototype of the device employed in Vim. The patent describes a scroll-type panoramic background used in conjunction with a treadmill capable of bearing the weight of a carriage and restrained horse. Although the treadmill illustrated in the patent is placed upon the stage and is masked by a ground-row, Burgess noted that in some cases it would be practical "to sink the endless path so that its top will be flush with the stage floor. . . ." Burgess also foresaw mechanical coupling of the treadmill and panorama noting that "the motion of the endless path can be made to give the movement to the panoramic screen through suitable intermediate means."

31 The pertinent devices are as follows: a treadmill brake in U. S. patent 286,709; an endless fence in patent 423,171; and treadmills mounted on winched carriages in patent 418,372. An earlier patent, U. S. patent 277,137, granted to Burgess 8 May 1883, illustrates coupling the various devices by means of belt drives. The belts are
these patents were granted after the devices were employed on stage—the endless fence of *The County Fair* race scene for instance—while others were probably applied for in anticipation of their future employment.

The combination of treadmills and panorama used in *The County Fair*, as described in *The Scientific American Supplement* (Fig. 6), was an elaborate mechanism employing three treadmills, a moving panorama and fence, and, perhaps, electrically powered screwjacks to lift the treadmills to stage level.\(^{32}\) If screwjacks actually were employed, the three treadmills were probably mounted together in a single large frame. At least one of the treadmills was mounted on a track so that the entire treadmill could be moved laterally (stage right to stage left) and thus permit Cold Molasses to appear to pull ahead of the other horses and win the race.

Although many accounts suggest that only one winched shown interconnecting a treadmill, an "endless belt" panorama, rotating side masking pieces, and an endless belt grass apron placed downstage of the treadmill. An annotated list of Burgess's U. S. patents is in Appendix B.

\(^{32}\) The principal sources of information about the mechanism of *The County Fair*, apart from information that may be extracted from Burgess's patents, are: "Electricity Behind the Stage," *The Scientific American Supplement*, 3 May 1890, pp. 11954-5; and Albert A. Hopkins, *Magic* (New York: Munn and Co., 1898), pp. 324-327. Unless otherwise indicated, information regarding *The County Fair* mechanism is taken from *The Scientific American Supplement*, which is itself indebted to an article and illustration previously published in *The Electrical World*, 12 April 1890, p. 253.
The *County Fair* scene at the Union Square Theatre, 1890. Note the figure of Neil Burgess in his Abigail Prue costume at the switchboard to the right. All machinery except the treadmill belts seems to be electrically powered. On the substage level from left to right are a motor, belt-drive, and bevel-gear transmission for the panorama take-up drum; motor, belt-drive, and bevel-gear transmission for the screw-jack left; another identical screw-jack left mechanism; and a motor with belt transmission for the endless fence. Below is the motor-driven blower for the wind machine, and in the cut-away at upper right is what appears to be a motor and belt drive for the fire curtain. This illustration and the one appearing in *The Scientific American Supplement* are identical. "Electricity Behind the Stage," *The Electrical World*, 12 April 1890, p. 253.
Fig. 6 The County Fair racing machine
treadmill was employed, *The County Fair* device probably employed a multiple winch arrangement so that the Cold Molasses treadmill could be pulled forward while those of the other horses could be winched to the rear, or so that the positions of the treadmills could be altered to simulate horses alternately losing and gaining ground. Burgess's patents—note especially U. S. patent 418,372—illustrate handwinch mechanisms for adjusting the positions of the treadmill carriages. The winch is employed to apply force to an endless line that runs over pulleys at stage right and left and is attached to the treadmill wagons at each end. Thus the treadmills could be winched either to the left or right. Although hand-powered winches are illustrated in the patent, it seems that machine powered devices were actually employed. A probably apocryphal story frequently mentioned in newspaper notices recounts that during the New York run "the man manipulating the levers which control the motor that moves the machine forward, lost his head and pulled the wrong lever, making the wrong horse win." 33 Another newspaper account indicates that in St. Louis a "steam motor" was used to move the treadmill wagon. 34 Burgess was noted for his interest in mechanical and electrical devices, and it is probable that

various motive devices were employed during the long run of the play.

The treadmill apparatus supposedly was lifted to stage level during the act break preceding the race scene by means of electrically powered screw jacks, although the need to employ such a lifting mechanism is not at all clear. Examination of an illustration of *The County Fair* mechanism in *The Electrical World* (Fig. 6) raises problems of interpreting the degree to which the illustrator accurately recorded the mechanism. Because the illustration is a cut-away front elevation of the scene, the forestage equipment obscures devices placed upstage, and the number of motors and screw jacks utilized cannot be determined. A logical assumption would be that four screw jacks were employed, one at each corner of the treadmill frame, operating in pairs driven by a single motor for each pair.

If one assumes that the Neil Burgess figure at the switchboard in the illustration is five feet tall, the dimensions of the mechanism may be estimated. The screw jacks to right and left would have been placed approximately thirty-four feet apart, a tremendous span considering the weight of the treadmills with mounted horses, and would have made necessary the use of structural steel or deep wooden trusses to adequately support the treadmill apparatus. No such truss is indicated, however, although this may be a result of an illustrator's attempt to simplify the drawing. A frame in the shape of an inverted "V" with a slotted
centerpost is shown at stage left; it may be part of the lifting mechanism or truss, or even some kind of tensioning mechanism, but its function is not apparent. If trusses or structural steel members were not used, it is likely that the treadmills and frames in which they were mounted were shorter than the drawing indicates.

Georges Moynet provides additional information in *Trucs et Décors*: "Two electric motors, each with a force of three horses, placed the whole in motion. Each treadmill with mounted horse weighed 1,500 kilograms and was able to bear a force of about 4,000 kilograms." With three treadmills the load on the lifting mechanism and the frame carrying the treadmills would have been substantial. One cannot but wonder why it was at all necessary to lift the device to stage level. Since the treadmill opening must have been covered before the race scene, the treadmills simply could have been concealed with practical wooden covers as was done in later productions with similar scenes. Such was surely the manner of readying the scene in *The County Fair* when on the road. A small ground row would have been sufficient to obscure the discontinuity of floor and treadmill for all but the spectators in the balconies. If screw jack lifts were


36 The use of treadmills recessed into the stage floor
actually employed at the Union Square, it would seem likely that it was the result of employment of fortuitously pre-existing machinery.

The treadmills appear to have been free turning devices driven by the horses themselves, but it is also possible that at some point in the play's long run power driven treadmills may have been substituted for the free running devices. Various accounts imply that there was some measure of control of treadmill motion, but this may have been only a treadmill brake. (One such is indicated in Burgess's U. S. patent 286,709.) In no domestic account of The County Fair machine is a treadmill drive specifically described, nor does such appear in Burgess's early patents. Indeed, U. S. patent 277,137 appears to indicate the use of the horse as a motive force to turn the associated panoramas. Only in U. S. patent 942,632, is a motor indicated to turn a horse's treadmill. Several other patents, however, (Fig. 7) reveal

and moved as a unit from side to side brought about the problem of concealing the gap to each side of the treadmill and into which the treadmill moved. The solution was the employment of "scruto," flexible covers much like those used with the "Corsican trap." U. S. patent 418,372, 31 Dec. 1889, secured Burgess the right to stage employment of treadmills mounted on winched wagons plus the use of a "flexible apron" to conceal the gaps created to either side of the treadmill carriage when it was moved. The patent further secured the use of multiple panoramas capable of being moved at different rates of speed to enhance the illusion of scenic depth (as will occur when the background scenery shows a slower displacement across the field of view than that of the foreground scenery).
that Burgess was not unaware of the benefits to be derived from using machinery to drive the treadmills instead of attempting to harness the animal's power, and several accounts of The County Fair mechanism do indicate that some kind of treadmill drive may have been employed.

French theatrical machinist George Moynet wrote—unfortunately somewhat ambiguously—that "a system of transmission activated each of the treadmills more or less," and a New York newspaper account of the 1889 The County Fair revival noted that "the pace of the horses in the famous race scene has been increased by doubling the power of the electric motors, and this, naturally, adds considerably to the realistic effect." It is possible, however, that the newspaper referred to the motors driving the panoramas and not to motors used to drive the treadmills themselves. Powered treadmills would have had certain advantages such as enabling the operator to force the horses to run and providing greater control of their speed. However, as late as 1890 a story is recorded that one of the horses refused to run on tour and that there was great anxiety about securing a replacement; the problem of motivating the horses would not have existed if powered treadmills were employed.

37 Note U. S. patent 442,796, and British patent 20,976.
38 Moynet, p. 328; and "At Other Houses," The New York Dramatic Mirror, 23 Nov. 1889, p. 4.
The horses were tethered on the treadmills by wire rope traces so that no accidents might result from a horse running off a treadmill. The illusion of the horses' movement was emphasized by means of a moving panorama rolled in a reverse direction behind the galloping horses, and by an endless picket fence placed downstage and moved in the same direction as the panorama.

The panorama was constructed as an endless belt which was driven by an electric motor using a flat belt drive, a clutch, and bevel gears to transmit motion to the vertical cylinders on which the panorama rolled. The downstage pickets were mounted upon an endless belt which passed over flanged wheels at stage right and left and through onstage guides which kept the pickets upright. The picket fence was belt driven by an electric motor at the same speed as the panorama behind.

Hopkins's description of the device, that it was "carried by two powerful rollers, and . . . turned by means of an electric motor so arranged that it may be unwound at any rate of speed," could be construed to apply to a scroll-type panorama because of the use of the word "unwound." Hopkins, p. 324. An endless belt panorama, however, would have the advantage over a scroll-type panorama in that its length would not limit the duration of the race. The Scientific American Supplement identifies the panorama as being an endless belt. "Electricity Behind the Stage," p. 11954.

Other accounts, however, indicate that different speeds were employed for the panorama and the downstage fence in order to give a more realistic illusion of movement. "The County Fair," Detroit Free Press, 9 Nov. 1890, p. 15. Burgess was aware of this possible elaboration of the effect--see note 37--and it is likely that in this respect The Scientific American Supplement is in error. "Electricity Behind the Stage," p. 11954.
The technology of power transmission used in The County Fair machinery was not new; it was commonly employed for factory equipment and, although breakdowns occasionally occurred, offered few difficulties in its stage application. The drive mechanism for The County Fair devices is clearly illustrated in an illustration from The Electrical World (Fig. 6). Flat leather belts from the electric motors, excepting that of the wind machine motor, invariably run to a long handled mechanism which is probably some type of clutch used to engage and disengage the machinery. Other flat belts transmit the motion from the clutches to the moved devices. In the case of the picket fence, motion was transmitted directly to the shaft or drum on which the fence turned. In the case of the panorama, motion was transmitted to a pair of bevel gears mounted beneath the stage at upstage right which were employed to shift the axis of rotation in order to turn the vertical panorama cylinders.

A final illusionistic touch was provided by the use of a wind machine to puff the jackets of the riders and to ruffle the manes of the horses. This consisted of an electrically powered, belt-driven blower placed beneath the

[Burgess's U. S. patent 277,137, referring to a device with coupled treadmill-panorama mechanisms, notes: "the main moving parts, as vertical or horizontal cylinders or rollers and the rotary trees, are connected by any ordinary and suitable arrangement of shafting and cog-wheels or belts within the skill of the average stage machinist."
stage which delivered air by means of a duct to a large, horn-shaped outlet onstage. However, The Electrical World illustration may again be deceptive; the duct to the stage seems to be only about ten inches wide in its visible dimension, and one wonders whether the blower illustrated would be able to create a draft sufficient to puff out racing jackets some twenty feet away.

The involved machinery employed in The County Fair occasionally suffered breakdown, especially on the road, and sometimes was altered to adapt it to new conditions or to augment the scenic effect. Newspaper accounts would lead one to believe that Messrs. Jefferson, Klaw, and Erlanger attempted to insure that the road company spectacle would not suffer in comparison with the Union Square scene. The scenery and apparatus required two sixty-foot long freight cars for transport, and the road company carpenters worked a week in advance of the company's arrival in order to adapt the local stage to The County Fair machinery.

Charles Jefferson had, at one point, two companies of The County Fair on the road while Burgess was ensconced at

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44 "At the Theatres," Chicago Evening Journal, 23 Aug. 1890, p. 10; and Cleveland Leader and Herald, 5 Oct. 1890, p. 16. Jefferson company No. 2, which often had but a single day between engagements, undoubtedly carried less elaborate scenery and did not work its carpenters so far in advance. Even this company, however, staged a three horse race. "Amusements," Columbus Dispatch, 3 Nov. 1890, p. 2.
the Union Square Theatre. A survey of "Dates Ahead" in the 1891 volume of *The New York Dramatic Mirror* indicates that one of these companies played short stands of from one to three nights, while the other played runs of up to several weeks in larger cities. It would seem doubtful that all companies employed the same elaborate apparatus; the return for a short stand would probably not justify the effort and expense of transporting and setting up the entire apparatus, and it is conceivable that the Jefferson second company utilized treadmill carriages that ran on top of the stage floor as indicated in Burgess's U. S. patent 442,796. It is evident, however, that the play's success was due in large part to the spectacle of the race, and Burgess augmented the effect by the addition of more horses. Five horses were employed in Boston in 1891, perhaps in an attempt to enhance the production's attractiveness in competition with Denman Thompson's *The Old Homestead*. Seven horses, and perhaps as many as nine, thundered across stages in later revivals.45

45 For several years *The County Fair* race scene employed three horses. In 1891 five were being used. "A Fair Start," Boston Herald Traveler, 6 Sept. 1891, p. 27. A notice in *The New York Dramatic Mirror* indicates that *The County Fair* was to appear at Proctor's in November of 1892 with nine horses, a clear case of "more is better." *The New York Times* indicated that *The County Fair* had been changed in revival "to bring it up to the requirements of the times . . . and there will be seven horses in the racing scene instead of three." "The Theatrical Week," 8 Dec. 1895, p. 12. The employment of seven horses in 1895 suggests the possibility that Burgess had augmented the original three horse treadmill apparatus with one of the four horse treadmills that had recently been constructed for his production of *The Year One.*
Apart from being simply an ingenious stage device, The County Fair race scene is significant in that it made extensive use of electrical power. Burgess's employment of electric motors to drive stage machinery is contemporaneous with the initial employment of electric motors to drive factory machinery and railway traction engines. The Scientific American Supplement commended Burgess's interest in applying electrically powered machinery to the stage, and noted that, as innovations appeared, The County Fair mechanism was constantly improved.46

In New York, The County Fair race scene also made use of the advantages of electric stage lighting. At the Union Square Theatre Burgess himself, who was not needed onstage at that moment, often controlled the electric light blackout that began and ended the race.47 The fair scene began with fair activity prior to the actual race. During a brief blackout just before the race, masking pieces representing booths and tents were slipped to the side; when the lights were again flashed on, the race was in progress. (The staging of scenes in subsequent plays with racing machines usually involved presenting the race in progress, since the

46 "Electricity Behind the Stage," pp. 11954-5.

47 See Fig. 6. The illustration shows Burgess's figure dressed in Abigail Prue's costume, at the control panels at stage left. Staging methods other than blackouts were occasionally used; in Cleveland in 1890 The County Fair race was revealed by raising a curtain. "Electricity Behind the Stage," pp. 11954-5; and Cleveland Leader and Herald, 7 Oct. 1890, p. 6.
difficulties of starting the race, usually including harnessing the horses to stays and, where powered treadmills were employed, persuading the animals to run and bringing the treadmills up to speed, were too numerous and varied to allow attempting the race from a standing start.) A similar blackout was employed to conclude the race. The sudden, complete change in light seems to have contributed beneficially to the effect, despite the occasional necessity to assure the audience that they should have no fear when the lights went out, and one wonders to what degree the production suffered where electric power was not available for stage lighting and electric motors, or indeed if the play was ever performed in such circumstances.

Enriched by the success of The County Fair, in 1895 Burgess undertook a major spectacle, The Year One, a comedy written by Charles Barnard and set in Imperial Rome in which Burgess played both Augustus Caesar and Gabylaria, a vestal virgin "of very uncertain age." The scenic investment for this play was substantial, pre-performance advertisements touting the production as being "Roman Realism Run Riot" and stressing that it displayed a "Twentieth Century Restoration


49 Program for Vim (n.d.) at Herzog's Ninth St. Opera House, Washington, D. C., in the program file, NYPL-ROSE.
of [the] First Century Coliseum."^50 The Year One, however, failed, beginning Burgess's financial decline, and is now most notable for its employment of racing machinery to simulate a chariot race upon the stage, a device later secured and elaborated by Marc Klaw for his production of the William Young dramatization of Ben-Hur.

In order to properly mount The Year One, Burgess leased and remodeled the old Star Theatre at a reported cost of over $75,000.\(^51\) The modifications were extensive, including recarpeting and reseating the house, and lowering the entire stage floor two feet at the front and three feet at the rear to improve sightlines. The pitch of the orchestra was altered for the same reason, and the stage roof raised thirty feet to facilitate flying of scenery. New incandescent lamps were installed in the house, and some 2,000 more on the stage alone. The proscenium opening was enclosed in a gilded frame, and the orchestra pit deepened so as to drop the musicians entirely from the sight of the audience.\(^52\)

The play opened to mixed reviews 2 November 1895,

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50 Advertisement for The Year One in the New York Times, 3 Nov. 1895, p. 12, col. 2.


52 Program for the New Star Theatre, 2 Nov. 1895, in the Davis Collection, Humanities Research Center, the University of Texas, Austin, Texas; and "The New Star Theatre," The New York Dramatic Mirror, 2 Nov. 1895, p. 2, cols. 2 & 3.
following several postponements due to mechanical difficulties with the new racing machines. The production was unready in many respects, having no incidental music and reportedly badly cued. The New York Dramatic Mirror characterized the production as being unhumorous despite there being ample opportunity for Burgess to clown, and suggested that Burgess's subdued performance was due to not knowing his lines. The supers were castigated as befitting a barnstorming tragedian, and the female chorus as being "the plainest lot . . . ever seen outside of Chicago," the Mirror suggesting that they were leftovers from the demise of The Bathing Girl, an unfortunate affair which had seen only one performance. The scenery was commended, if only in a single phrase, but the race sequence, which the Mirror characterized as being the audience's sole hope of entertainment, was described as being ludicrous and unexpectedly anticlimactic:

After a seemingly interminable wait, the curtain rose on a scene showing the interior of the Circus Maximus. On the left of the stage was a chariot drawn by four coal black horses, which were dashing along toward the audience at breakneck speed. On the right was another chariot, drawn by four white steeds, one of which was dashing madly on to victory, while his three companions looked at him in mute surprise. It was a piece of magic worthy of the great Hermann. That one horse should run, while his three assistants, attached to the same vehicle, stood

stock still, was so remarkable that the audience simply sat and gasped. Then they had a laugh, but the laugh was at the expense of Mr. Burgess, for the play was declared between the laughs to be the most perfect case of fizzle ever seen in New York.  

Many of The Year One's defects were to be remedied in later performances. The recalcitrant horses were motivated to run, music was inserted, but the New England Spinster mannerisms in Burgess's performance of Augustus were not destined to please. Comparison of the opening night playbill with the bill of a week later shows the inclusion of much incidental orchestra music, and the expansion of act three from one to three scenes, scenes which were probably not ready in time for the announced opening. These scenes, "Between decks of the Imperial Galley, Slaves rowing" and "The Grand Landing at the Temple of Neptune," are curiously suggestive of the spectacular scenes to be featured later in Ben-Hur.  

The race scene, "In the Circus Maximus," prefigured the

54 "Star-The Year One," The New York Dramatic Mirror, 16 Nov. 1895, p. 16.

55 C.f. programs of the New Star Theatre, 2 Nov. 1895 and hand noted 8 Nov. 1895 in the Davis collection, Humanities Research Center, The University of Texas, Austin, Texas. It is possible that the changes of scene may have been instigated by the play's poor reception rather than simply not having been ready for opening night; during its second week The New York Times noted that "Mr. Burgess has been diligently at work making changes in the play during the last week, and the changes are so great that the production will be practically a new one." "Notes of the Stage," The New York Times, 10 Nov. 1895, p. 12.
celebrated race between Messala and Hur in *Ben-Hur*. The *Year One* race comprised two four-horse chariots, one team white and one black, arranged upon treadmills aligned so that the horses galloped toward the audience. The scene was staged so that the curtain rose upon the running horses, the audience's anticipation whetted by the sound of hooves drumming in the darkness. Although accounts of the performance do not detail how the scene was staged, it is not unreasonable to suppose that moving panoramas might have been placed diagonally at each side of the treadmills, and that the gap between them might have been obscured with dust and darkness. As in *Josiah Allen's Wife* and *Vim*, the race scene concluded the play, so there would have been no necessity to clear away the racing mechanism, which was said to weigh more than twelve tons.

A program note announced that the stage floor was arranged to sink, perhaps with a jack mechanism similar to that of *The County Fair* illustrated in *The Electrical World*, and that it was lowered two feet below its usual level for

56 "Star-The Year One," p. 16.

57 U. S. patent 666,714, assigned to D. I. Towers, 29 Jan. 1901, (perhaps the same David Towers who previously was manager of *The County Fair* at Proctor's Twenty-third Street Theatre) details how such an effect might have been accomplished. It employed diagonal panoramas with the upstage gap between the panoramas concealed by the output of steam pipes and dust blowers. The second sheet of this patent illustrates a trick chariot-wheel mechanism similar to that employed in *Ben-Hur*.

58 "Heavy Stage Machinery," p. 16, col. 3.
the race sequence. Whether this was done to improve sightlines or, as the program suggested, to protect the audience in case of runaway is not known, and it is difficult to imagine what visual effect such lowering would have had upon the scene. It was not unreasonable to fear large animals running amok amid the audience; *The New York Times* had just such reservations regarding the cow in *The County Fair*, and orchestra pit palings, originally erected to prevent the audience from encroaching upon the stage, had protected audiences from wayward horses in the past. A lowered stage platform would have made it less likely that a runaway horse could have leapt across the pit into the auditorium, but an ill-considered joke by Burgess, that he had deepened the orchestra pit for just this purpose, had raised such unrest previously among the musicians that it is unlikely he would have continued to emphasize such a claim. In any case, by this time Burgess would have had

59 New Star Theatre program, 2 Nov. 1895, in the Davis Collection, Humanities Research Center, the University of Texas, Austin, Texas.


61 Another program noted, "Mr. Burgess is desirous of assuring the audience that it is impossible for the horses to get over the footlights under any circumstances, as in case any of the machinery should break, the part or parts would fall under the stage and the horses will remain securely in their places." Program for *The Year One* at the New Star Theatre, in the program file, NYPL-ROSE, and "The New Star Theatre," p. 2.
considerable experience in tethering and securing racing animals, and the program note to the effect that the lowered floor increased the safety of the audience must have been made more for its psychological effect.

During *The Year One*'s brief tenure at the Star Theatre Burgess successfully weathered a second test of his assiduously pursued patent rights. In the United States Burgess first employed his carefully protected patents to challenge possible encroachments upon his device in 1890, when his patents were upheld by an injunction against a Mr. Chapman, which established that Burgess had developed a unique combination of devices, even though individually the machines had been employed previously by others. In 1895 Burgess's rights were tested again, this time by Jefferson Patton, a man who may have been a former machinist of the Marine Manufacturing Company, a firm employed by Burgess to construct the racing machines for *Vim*, *The County Fair*, and

62 Chapman was probably Frank M. Chapman who in March of 1890 was granted U. S. patent 423,372 for a turntable-panorama apparatus. Chapman attempted to defend his infringement upon Burgess's device on the grounds that the Burgess machinery lacked "patentable novelty," and cited substantial previous theatrical employment of its elements. The decision by Judge Colt was for Burgess because of the novel combination of devices. In question were claims 1 and 2 of U. S. patent 286,709, claims concerning the combination of treadmill and panorama, and the employment of a winch with line attached to the horse's harness in order to adjust its position upon the treadmill. *Burgess v. Chapman* 44F. 427 (1st Cir. 1890); and *The New York Dramatic Mirror*, 18 July 1891, p. 16.
The Year One. Although Patton's request for an injunction against the Burgess production of The Year One was dismissed in Burgess's favor, The Year One itself was a failure.

The Year One played at the New Star Theatre for approximately six weeks, but failed to find popular support despite several later favorable reviews. Burgess was forced to revive The County Fair, supposedly with new scenery and music, but was unable to stave off the ruinous losses of The Year One. Following the loss of his lease of the Star, a desirable property due to his extensive renovation, Burgess filed for bankruptcy in the U. S. District Court in Trenton, New Jersey, listing his liabilities at $21,113 and his assets as two suits of clothes valued at $25.

Neil Burgess was to make no further new employment of the racing machines he developed, yet they were to become an intangible asset when Marc Klaw persuaded Gen. Lew. Wallace to authorize a version of Ben-Hur for the stage. Burgess's racing machine was to be improved and used with good effect in the scene of the climactic chariot race at Antioch.


Erlanger, Klaw, and Jefferson were all familiar with the potential of Burgess's device, having been managers of various The County Fair companies. and Klaw was to adapt The County Fair and The Year One mechanisms by special arrangement with Burgess.

Burgess himself was unable to mount other successful new productions after The Year One, and in 1896 was again touring The County Fair under the management of Charles Frohman. The play maintained its hold on the public, and was toured to Great Britain in 1897. Burgess continued to tour The County Fair from 1897 to 1909—Boston saw its 5000th performance in 1902—but the sensational race scene finally became too familiar to sustain its slight plot, and in 1909 Burgess was reduced to playing a truncated version of The County Fair on the Keith vaudeville circuit. This version retained the race, with seven horses, but entirely

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66 Cleveland Plain Dealer, 5 Oct. 1890, p. 9; and Cleveland Leader and Herald, 5 Oct. 1890, p. 16.

67 Although other sources frequently declare that Erlanger was indebted to Burgess for much of the machinery used in the Ben-Hur chariot race, rarely is Burgess prominently credited in syndicate sources. A program for the Colonial Theatre, Boston, for 21 April 1902, declares that "the moving floor effect and panorama [was] invented and patented by C. L. Hagen ... Messrs. Klaw and Erlanger acknowledge their indebtedness to Mr. Neil Burgess for some of the patented appliances used in the chariot race." Program in the program file, NYPL-ROSE.


69 "Recent Deaths," Boston Evening Transcript, p. 3.
eliminated the first two acts. Burgess, then sixty years old, fell ill and retired to his New York home where, after an illness of more than a year, he died 19 Feb. 1910. Although Burgess did not further elaborate his racing mechanism following *The Year One*—his patents after 1895 dealt for the most part with devices that had been used in previous plays—the racing machines he pioneered saw further employment in France, England, and the United States, especially in Marc Klaw's lavish production of *Ben-Hur* in 1899 and the years following. The devices employed by Klaw and his machinist Claude Hagen in the Hur-Messala chariot race were deeply indebted to the machinery perfected and employed by Neil Burgess in the last decades of the nineteenth century.

70 With the major part of the exposition excised, the remnants of the plot must have had little value as drama, the spectacle of the race being the sole reason for exhibiting this turn. "The Vaudville Theatres," *Boston Evening Transcript*, 9 Mar, 1909, Part 2, p. 14, cols. 2 & 3.

71 "Recent Deaths," *Boston Evening Transcript*, p. 3, col. 1.
CHAPTER III

RACING MACHINES—

THE PATENTED DEVICES OF BURGESS AND OTHERS

A chronological examination of Burgess's patents reveals that Burgess consistently elaborated and improved his racing mechanism over a period of at least twenty-two years. Patent 256,007, application filed 22 March 1880, is the first of a series of many patents in which Burgess attempted to secure rights to the basic combination of treadmill and panorama.

The patent illustration (Fig. 5) depicts a treadmill device bearing a horse and carriage, the carriage tethered to prevent the horse from pulling it off of the treadmill. The treadmill is mounted on a substantial frame which rests upon the stage floor, the whole mechanism being sandwiched between a scroll-type panorama upstage and a low, forestage groundrow. The written description notes that side and top masking were expected to be used, and that on many stages it would be possible to sink the treadmill into the floor, thus obviating the need for a masking groundrow.

The patent text gives no information about the construction of the treadmill apart from noting that it was 64
"an endless belt or path—such in general as is used in horse-powers—made sufficiently strong to bear the weight that is designed to be put upon it. . . ." The drawing shows a treadmill approximately eighteen feet long, having end cylinders about ten inches in diameter, and six intermediate, supporting, idler cylinders about six inches in diameter. The treading surface appears to be segmented, but its precise construction cannot be construed from the drawing. Contemporary agricultural treadmills, however, employed treads of seasoned hardwood slats hinged together to form an endless belt, and a similar construction may have been anticipated for the racing devices.

Neither patent drawing nor text indicates that a brake or other speed control device was employed, nor do they indicate any intermediate support between the idler cylinders, which, on twelve inch centers, seem to be widely spaced. Since a treadmill brake would have been necessary to safely position and hitch up the horse, and since brakes were commonly employed on agricultural treadmills, one can assume that a brake was omitted from the patent description only because it was not germane to this particular patent application. Likewise, the patent drawing of the treadmill carriage with its six widely spaced idler cylinders differs from agricultural equipment in that agricultural treadmills usually employed a series of idlers so closely spaced that they almost touched one another. This close spacing, while slightly increasing the number of cylinders and the friction
inherent in the device, was necessary for firm support of the belt so that it would not droop excessively between the rollers. Firm support would have been one of the problems that Burgess encountered since trotting and galloping horses would have placed a much greater impact load upon the belt than would plodding work horses. It is reasonable to assume that the patent artist simplified the drawing by omitting some of the idler cylinders as well as the treadmill brake.

Patent 256,007 probably reflects the device Burgess first employed in the entertainments which evolved under the various titles Josiah Allen's Wife, My Opinions, and Vim, or A Visit to Puffy Farm. At some date around January 1883 Burgess altered Vim in order to make double employment of the racing machine. The third act was expanded to include a nightmare circus scene in which Burgess appeared in the character of Tryphena Puffy as a performing circus bareback rider. The scene was the interior of a circus tent, the horse trotting upon the treadmill. The scene was cleverly arranged with Josiah Puffy dreaming downstage while the bareback ride action was prepared upstage. At the conclusion of the scene a drop was let in showing the exterior of the circus tent. This formed the backdrop of an intervening scene while the horse and wagon were readied upstage for the buggy-ride that formed the conclusion of the play.

There is no patent evidence circa 1883 that gives a clue to the bareback riding mechanism, and it may be that no
change was made in the buggy-ride machine except for substitution of the circus surroundings and elimination of the wagon. It is unlikely, however, that Burgess did not employ some additional mechanical aids.

A late Burgess patent filed in April 1906, some eleven years after the last performance of *Vim*, may be an elaboration of the device used in that play. This patent, no. 924,632, granted 15 June 1909, established rights to a device for simulating a circus bareback rider's performance.¹

The patent (Fig. 7) describes a double set of stationary treadmills, each equipped with a motor drive and speed regulating device, and a set of upright stanchions intended to bear a rigid harness designed to constrain the horses upon the treadmills. The riders are shown each equipped with a harness and detachable supporting wire which is led over pulleys concealed above them, and then to off-stage counterweights. A helper, guiding the support wires from a platform concealed above the treadmill, helps the riders maintain their balance. The rigid harness worn by the horses was to hold them steadily in position, yet allowed them free motion to move up and down so they would seem to trot naturally upon the treadmills. Furthermore, the harness was designed so that it could be surreptitiously engaged and disengaged from the stanchions, which were to be

¹ See ch. II, pp. 34-35; also note Burgess's U. S. patent 996,452, granted posthumously 27 June 1911, which describes another circus riding device (see Appendix B).
Fig. 7 Illustration from Burgess's U. S. patent 924,632

Note the idler wheel and slipping belt mechanism at right which engages the motor and treadmill. The horizontal lever 33 is part of another idler wheel and slipping belt device used to engage a unique applause machine shown upper right in the peak of the tent. Sheets 2 and 3 of the patent illustration (not shown) illustrate plan views of the dual treadmills and details of the riders' and horses' harnesses.
Fig. 7 Illustration from Burgess's U. S. patent 924,632
concealed by background scenery, so that the horses could be
led into position in view of the audience, the act
performed, and the horses then led off, furthering the
illusion of an encumbered ride upon untethered animals.

This patented device incorporated several notable
innovations, especially the detachable, rigid harness and a
bizarre applause machine (see Appendix B), but the
innovation most germane to earlier development of the racing
machines was the possible employment of a treadmill drive
motor.

The patent illustration shows the treadmills being belt
driven by a concealed motor, the speed being regulated by
means of an idler wheel bearing upon a slipping belt
mechanism. The idler wheel is attached to a third class
lever and bears upon the upper surface of the treadmill
drive belt. With the mechanism shown, pressing the lever
toward the drive belt would increase tension in the belt and
increase friction about the motor drive pulley, thereby
reducing belt slippage and increasing treadmill speed. Such
a mechanism, of course, would require careful operator
attention to prevent the treadmill from over-running and
tripping the horses. It would also have, however, the
concurrent advantages of forcing the horses to move on cue
and allowing most of their effort to be applied to running
freely and not to driving the treadmill belt.

The effort required to drive the treadmill belt and any
connected machinery would have caused the horses to labor
and would have detracted from the illusion of relatively free-running horses. This appears to have been a problem early recognized; the Burgess patent notes:

Many devices of this character have here-to-fore been invented and patented by me, but in such devices I have found that in order to maintain the traveling platform level or practically so, the movements of the animal or animals are restricted owing to the power required to move the platform or path. It has, therefore, been impossible to give to the animal an appearance of traveling as fast as could be desired, and by within improvement [i.e., the motor drive] I have overcome this defect. . . . By means of this motor the platform may be caused to travel at any desired speed so that practically no effort will be required on the part of the animals to cause the platform to move and they can, therefore, exert their entire efforts in speeding.

There is no conclusive evidence, however, that Burgess incorporated a treadmill drive motor in any of his realized machines for the stage, although several accounts suggest such use of a motor drive (see pp. 47-48).

Burgess's second patent of the treadmill-panorama device, no. 277,137 granted May 1883, shows a device considerably elaborated over that of the first patent. Many of the improvements were possibly used in Vim, and were later employed in the racing machine for The County Fair and in the chariot race apparatus in Ben-Hur. As a unified mechanism, however, the device seems to have been impractical.

The patent drawing (Fig. 8), like that for Burgess's first patent, shows a horse and buggy upon a treadmill
The lower drawing is a schematic of the interconnection of the animated scenic elements. Note that only belt transmissions are shown. A cutaway in the center drawing on endless mat e indicates the hooks used to join and separate the endless-belt grass mat.
Fig. 8 Illustration from Burgess's U. S. patent 277,137
masked by a downstage groundrow and placed before a rear panorama. This device, however, employs a system of transmission belts to mechanically link all the movable scenic parts, which, in this new device, have been considerably increased in number. Not only does the panorama unscroll behind the buggy, but an endless horizontal belt of grass matting set into the floor rolls downstage of the buggy. At stage left and stage right, masking the ends of the panorama and groundrow, are more mechanically linked, movable masking pieces. Although the patent description notes that these could be any suitable scenery, in the drawing they are a rotating tree at stage right and a series of smaller trees mounted on a short endless belt at stage left. The trees at stage left, if actually constructed according to the drawing, would have been most impractical since their "branches" would interfere with one another as the trees made the turn about the cylinders at the extremes of the belt.

With this device the entire stage picture could be set in motion. The drawing shows all the parts to be belt driven, and all connected in such a way that the scenery moves properly relative to the apparent movement of the horse and buggy (i.e., receding in the direction opposite to the buggy's movement). Although belting is the means of transmission depicted, Burgess attempted to prevent infringement by other mechanisms by noting that any "suitable arrangement of shafting and cogwheels or belts
within the skill of the average stage-machinist" might be used as well. Nevertheless, in all probability a transmission of drive belts would have been used. Belt drives would have been familiar to most mechanics, being commonly employed with agricultural equipment and in various power take-offs in hundreds of large mills and factories. Moreover, the use of transmission belts afforded considerable ease in the setup and adjustment of equipment, it being relatively easy to adjust tensions and positions of equipment by adding and removing sections of belts, installing pulleys, and by twisting the belts where necessary in order to change direction.\(^2\)

Unification of all movable parts by a transmission of flexible belting, however, would seem to be impractical without some sort of auxiliary power device to drive the apparatus. Although the effect could possibly have been self-powered by the horse on the treadmill, the considerable effort required to set all of the scenery in motion would have compromised the image of a freely trotting horse (it may be only artistic license, but in both patents 256,007

\(^2\) Leather drive belts were commonly riveted, hooked, or sewn together, although some power plants and factories which required smooth running belts had experimented with glued joints. The use of hooked belts enabled easy removal of belts from enclosed pulleys and the easy addition or removal of belt segments. The patent description notes that the green endless mat downstage might be removed easily and quickly from the stage by disjoining the hooks that held it together. The treadmill belts, however, were probably hinged together, since it is not likely that they were frequently removed from their machines.
and 277,137 the horses are depicted in a trot). Self horse-powered apparatus with interconnected animated scenery therefore could not have been employed in the racing plays. However, the economy and mechanical elegance of unifying the moving parts of the effect in this fashion would have been very tempting, and the failure of such an attempt may have prompted Burgess to attempt to utilize motor driven treadmills and panoramas, as he indicates in patent 924,632.

Patent 277,137 also makes mention of another illusionistic device that was successfully employed in both The County Fair and Ben-Hur; this was the inclusion of a blower with ductwork concealed behind the groundrow. The ducts directed air to flutter the hair and dress of the rider in order to further the illusion of rapid motion in the open air. The blower and ducts, however, are not shown in the patent drawing, nor are they included as a part of the specific claim of the patent.

The racing machines in The County Fair and later racing plays employed a mechanism of movable treadmills capable of running several horses and of regulating their positions in order to heighten the suspense of the race and to select the winner. Burgess patent 286,709, filed just two months after filing on the integrated scenery device in patent 277,137, was an attempt to secure rights to a simple racing machine which would accomplish just this effect.

Patent 286,709, granted 16 October 1883, depicts a device consisting of a treadmill equipped with a treadmill
brake, and a windlass to which is attached a wire used to tether the running horse (Fig. 9). The windlass is used to maintain the horse upon the treadmill and to adjust the horse's position, the restraining wire or rope from the windlass being yoked to the horse's girth or other part of the harness. The brake is a first class lever having a curved section at the proximal end which bears upon one of the end drums of the treadmill. Burgess's description notes that by manipulation of the windlass and brake the horse could be maneuvered to any desired position on the treadmill.

The third figure of this patent illustration shows two treadmills placed side by side downstage of a moving panorama in an arrangement that might be used to simulate a race in which the horses run "alternately gaining and giving ground." The patent description notes that "it is evident that [the] invention may be used to represent the well known circus performances upon a single horse--as bare-back riding and the like . . ." suggesting that this arrangement might have been a prototype of that used in the Vim circus scene and Neil Burgess' Country Circus.

The disadvantages of this device for stage use are obvious: the wire or rope tether could prevent the horses from running off the end of the treadmills, but not off the sides, and the wire or rope, extending offstage to the winch, would have been most difficult to conceal. The more
This patent illustrates a primitive mechanism for controlling the position of the horses upon the treadmills. Note the spring-released treadmill drum brake at f & g in the center illustration, and the very visible stay-line tethering the horses.
J. W. KNELL.

APPARATUS FOR PRODUCING ILLUSORY DRAMATIC EFFECTS.

No. 286,709.

Patented Oct. 16, 1883.

Fig. 1

Fig. 2

Fig. 3

Fig. 9 Illustration from Burgess's U. S. patent 286,709
elaborate machine employed for The County Fair accomplished the racing illusion with none of the drawbacks inherent in this earlier device.

Burgess's patent 418,372, filed 9 May 1889, delineates a device designed to solve both the problem of invisibly adjusting the positions of the horses on the treadmills and of constraining them upon the movable path. This patent (Fig. 10) displays a racing machine almost fully evolved toward that employed in The County Fair, lacking only the downstage moving pickets and motor drives for the panoramas and, possibly, the treadmills.

The patent illustration shows horses running upon treadmills sunk into the stage floor. The treadmills themselves, however, have been mounted upon wheeled carriages which run upon rails traversing the stage. The relative positions of the racing horses can be established by moving the treadmill carriages, the horses being allowed to run steadily upon the treadmills. This is accomplished by means of windlasses mounted beneath the stage which, in order to control carriage movement in both directions, act upon endless lines brought out to each side of the stage, around pulleys, and returned to be secured to each end of the treadmill carriages. The horses were secured to their treadmills by linking their girth-straips to an upright stanchion attached to the carriage frame (Fig. 15).

In order to conceal the void left in the floor to either side of the treadmill carriage, Burgess planned to
Fig. 10  Illustration from Burgess's U. S. patent 418,372
Fig. 10 Illustration from Burgess's U. S. patent 418,372
employ flexible aprons, weighted at the ends, and attached to each end of the treadmill carriages. The aprons would be drawn over rollers placed at the extremes of the treadmill carriage slots, and dropped beneath the stage floor, the weighted ends keeping the aprons taught. The openings were thus concealed by this device which very much resembled large, sturdy, roller blinds built into the stage floor.

The patent drawings show a treadmill belt of much different construction than previous illustrations. Instead of using a flexible belt running upon close-set idler cylinders, this device uses a belt composed of sturdy slats, each of which ran upon integral wheels set into the slat ends and riding upon a continuous track supported by the treadmill carriage. Thus, instead of running upon external rollers, each slat ran upon its own, set into the slat ends. By this means the close set slats would always be supported on wheels, and the treadmill belt would not droop disturbingly between idler cylinders and upset the horses's footing.³

³ The method of supporting the treadmill track by means of rollers beneath the flexible belt appears in most Burgess patents, some of which, such as patents 256,007 and 286,709, show extreme distances between the supporting rollers. In these cases one must assume that the illustrations show artistic license, since the amount of belt sag would have been extreme. English patent 9068 (and Burgess's U. S. patent 418,372 for the same device), accepted 13 July 1889, is the only Burgess patent to display the seemingly ideal method of support by integral treadmill belt rollers. In this device (Fig. 15) the treadmill slats carry rollers set into the slat ends. There are two wheels at each slat end which ride on a track built into the treadmill carriage
The panorama in this device was also different than those previously described in that it was a double panorama consisting of two endless cloths, "wound and unwound in the usual manner," one taller than the other and arranged to work within the perimeter of the lower. The drawing shows close background scenery painted upon the lower belt, and far distant scenery (mountains) painted upon the taller. The patent description notes that they are "adapted to be wound at different rates of speed." This, of course, was to enable slower visual displacement of distant scenery than of nearer scenery, as is observed when one watches an event from a moving platform. In this way the illusion that the audience kept pace with the swiftly moving horses was enhanced. The drawing shows no transmission or gearing between the panoramas, but an arrangement to appropriately interconnect them would have been simple to accomplish; indeed, if the panorama drums were simply geared together by an idler gear, the inner, taller panorama would turn more slowly by virtue of its drum being of lesser diameter.

Burgess's U. S. patent 423,171, granted 11 July 1893, illustrates one of the last illusionistic devices that were frame. Whether there are interior supporting wheels is not possible to discern from the drawing or text. The slats are covered with some traction providing surface, not specified in the patent description, and are flexibly joined edge to edge. It is probable that they were to be hinged together, as was common on other treadmill devices. Hinging would have enabled easy replacement of defective slats, whereas wear of a non-sectioned belt would require disposal of the entire surface.
incorporated in The County Fair racing machine. This device (Figs. 11 & 12) gave the illusion of a moving picket fence behind which the horses ran upon their treadmills. Undoubtedly perceiving that the "galloping horses" upon their treadmills did not appear to be as swift as unconfined racehorses, Burgess sought some way to enhance the illusion of speed. The picket fence, placed downstage and moved so as to retire rapidly in opposition to the horses' movement, would help in two ways. By increasing the speed of the retreating fence, the horses could be made to appear to be running more quickly. Also, the moving pickets partially obstructed the view of the galloping horses' legs and thus tended to disguise the fact that the horses might be running less than freely.  

The picket fence was either a segmented belt composed of pickets hinged together at their widened bases, or an endless belt of leather, canvas, or other flexible material to which the bases of the pickets were attached. The joined pickets wound about pulleys placed just below stage

4 During its long tenure on the stage, the speed of The County Fair racing effect was increased, and the illusion was said to be very realistic. The increase in speed was probably accomplished through employment of more powerful motor drives for the panoramas, and by employment of more efficient bearings for the treadmill rollers and panorama hangers. Commentators often noted the rapidity of the race, the Boston Herald Traveler declaring the "landscape, fences, poles, hills and houses came into sight, only to disappear with the rapidity of lightning, while in the center of the stage . . . five handsome thoroughbred horses were galloping under whip and spur." "A Fair Start," 6 Sept. 1891, p. 27.
This illustration shows an elevation of a mechanism very similar to that employed in *The County Fair*. At lower right is the belt drive for the moving picket fence.
J. W. KNEILL.

APPRATUS FOR PRODUCING ILLUSORY DRAMATIC EFFECTS.

No. 423,171.

Patented Mar. 11, 1890.

Witnesses:

[Signatures]

Inventor.

[Signatures]

James W. Kneill

Simonds & Co.,

Fig. 11 Sheet 1 from Burgess's U. S. patent 423,171
A plan view of the racing mechanism is shown above; below, an end view of the moving fence. Note that these views show the treadmill carriages running on the stage surface, while in sheet 1 they seem to be inset flush with the floor.
APPARATUS FOR PRODUCING ILLUSORY DRAMATIC EFFECTS.
No. 423,171.
Patented Mar. 11, 1890.

Fig. 12 Sheet 2 from Burgess's U. S. patent 423,171
level at left and right. While traversing below the stage the pickets hung upside-down, and turned upright as they passed through slots cut into the stage floor at right and left. A guide in the form of a split iron bar was provided to hold the pickets upright as they passed above the stage floor. This bar, which to the audience would appear to be a rail near the top of the fence, was brought down and secured to the stage floor at far right and left, and could even be extended below the floor in a widening "v" shape in order to better catch and guide the entering pickets. The patent notes that the belt was to be "provided with means for turning the pulleys at any desired rate of speed," and the accompanying drawing shows the fence to be belt driven from a shaft beneath the stage, the driving mechanism and upstage termination of which cannot be seen.

The moving pickets, while enhancing the racing illusion, further complicated installation of the racing device in that they required transverse grooves to be cut into the stage floor at left and right, thus necessitating further shoring and cutting in stages that were not already equipped with slots in the necessary positions. Most of the other devices employed in The County Fair could have been rigged, if necessary, to play on the surface of the stage. Panoramas could be driven from above (as is indicated in U. S. patent 423,171), or by motors placed on the stage floor behind them. With appropriate masking, the treadmill carriages could be run on tracks also placed upon the
surface of the stage. Some thought must have been given to
devising a means of working the moving pickets above the
stage surface as well, because U. S. patent 501,099, granted
to Jefferson Patten 11 July 1893 and assigned to Neil
Burgess, details just such a device.

Jefferson Patten may have been a machinist for the
Marine Manufacturing Company, the company employed by
Burgess to construct racing machines for *Vim, The County
Fair*, and *The Year One*.\(^5\) His patent is for an improvement
to the picket fence illusion in which a series of v-grooved
pulleys, acting in pairs set at right angles to one another,
are used to change the plane of the picket's travel so that,
instead of passing through the stage, they could be brought
to lie upon the stage surface and thus passed unseen by the
audience from one side of the stage to the other.

An examination of the patent illustration (Fig. 13)
suggests, however, that Patten's device was not without
drawbacks. A sufficient distance between adjacent pulleys
would be necessary so the when the pickets changed plane
they would not unduely twist and stress the endless belt.
Also, a clear space upstage as wide as the fence was high and
extending from stage right to stage left would be needed to
allow the pickets to travel flat across the stage. If the
stage was deep enough, however, the needed space could have
been provided behind the treadmill carriages or even upstage

\(^5\) See ch. II, pp. 60-61.
Fig. 13 Illustration from
Jefferson Patten's U. S. patent 501,099

This patent illustrates a mechanism designed to enable
the use of an endless-belt moving fence effect rigged
entirely above the surface of the stage.
Fig. 13 Illustration from

Jefferson Patten's U. S. patent 501,099
of the backing panorama, provided a panorama was used and the picket belt was long enough. There seems to be no evidence that this device was ever employed, and it is possible that Burgess purchased the rights simply to forestall competition. However, provided that there was sufficient space for its employment and provided that the noise of numerous pickets sliding across the stage was acceptable, this device, combined with the other surface devices, would have permitted employment of the full racing illusion without piercing the stage floor.

The problem of providing a firm treadmill footing for the running horses inspired several different solutions, many of which are reflected in the patent illustrations. U. S. patent 736,360, granted to Neil Burgess 18 August 1903, illustrates one of the final stages in the development suitable treadmill belts and carriages (Fig. 14).

This device was designed to be an animal exercise machine capable of use aboard ship or in other confined places where it was necessary to keep a running animal in trim. It consisted simply of an inclined treadmill with a restraining chain at the top, the treadmill being equipped with belt tensioning screws at the lower end and extendable legs at the top end with which to vary the incline and thus cause the animal to perform more or less work. The treadmill belt was formed of three thick, flexible bands across which were riveted hardwood slats which joined the
Note the screw actuated belt tensioning block $g_1$ and $g_2$ in the upper illustration, and the hinged slat belt joining device in illustration fig. 11. Sheet 2 of this patent (not shown) displayed a variation of the device not essentially different from that illustrated on sheet 1.
Fig. 14 Sheet 1 from Burgess's U. S. patent 736,360
three belts into a single surface.\textsuperscript{6} The slats were covered with a "suitable material" to form a track surface—in this case probably some sort of reinforced rubber. The ends of the belt were joined by hinging together the extreme slats at the ends of the belts. One of these slats was made less thick than the other so that it could be screwed to a reinforcing strip of metal attached to the belt end without increasing the thickness of the belt. This screwed-on slat provided a means of separating the belt so that the belt could, if necessary, be removed, rolled up, and stored.

The three strips of belting to which the slats were secured ran upon rollers whose axles were supported by the treadmill side frame. These rollers were staggered on each succeeding axle in order to provide a more even support than could be provided by in-line rollers. Nevertheless, it may be perceived readily from the patent illustration that as many as two slats might be unsupported at one edge in the spaces between the rollers. At these points only the rigidity of the belts or the wedging effect of very closely spaced slats would keep the surface from sagging beneath the animal's tread. Moreover, it will be perceived that these two methods of firming the surface are not compatible; tightening the belt tension would increase the spacing.

\textsuperscript{6} These were probably leather belts rather than rubber. Considerable expertise had been acquired in the manufacture of hard, durable leather belting for powerful machine drives. The leather surfaces would be less liable to wear running over the supporting rollers than would rubber belts.
between slats, thus reducing the efficiency of the wedging effect.

A slight sagging of the running surface was perhaps acceptable in an exercise machine, but could not be tolerated in a stage device intended for fast running animals. This defect could be cured by incorporating a great number of closely spaced rollers in the stage devices, but the concurrent increase in noise and friction would probably necessitate the employment of high quality rollers and bearings.  

A treadmill similar to that in Burgess's English patent 9068 (Fig. 15) is shown in English patent 12,230, granted to theatrical manager Adrian Williams 7 Sept. 1889. This device does not seem to differ from the basic Burgess devices in any unique way except that its treadmills were arranged to travel perpendicular to the proscenium opening.

7 Some of the effort required of the horse to move the treadmill would have been alleviated by the employment of devices such as ball bearing rollers to support the treadmill belt. Inexpensive ball bearings, however, were not readily available until the late 1880's, after Friedrich Fischer developed a machine for grinding steel balls in 1883, and undoubtedly were not employed by Burgess in the earliest of his racing machines. The Ben-Hur treadmills, however, were equipped with ball bearing rollers and were so well adjusted that it is said that they could be set in motion with a slight push. Sigvard Strandth, A History of the Machine (New York: A&W Publishers, 1979), p. 219; and Benjamin E. Smith, "The 'Ben-Hur' Chariot Race," St. Nicholas, April 1901, p. 46.

8 Burgess's English patent 9068 is identical to his U. S. patent 418,372, which was filed several months earlier than Williams's patent (9 May 1889 opposed to 1 Aug. 1889).
Fig. 5 of this illustration is an interior view of the side of the treadmill carriage frame; fig. 6 is a section of one of the slats, the dotted lines indicating the integral wheels. Note the upper drawing shows a method of securing the horses to the carriage frame.
Fig. 15  Sheet 2 from Burgess's British patent 9068
The Williams device (Fig. 16) employs a flexible apron to cover the gap created by the treadmill carriage slot, and, because it was designed to run toward the audience, does not employ a moving panorama. The treadmill carriages are winched from beneath the stage by windlasses hauling upon an endless line attached to the front and back of the treadmill carriage. The flexible apron, unlike that in the Burgess patent, is not weighted to draw it over rollers at each end of the carriage path, but is instead composed of stiff, articulated planks having rollers at each hinge point. The rollers work in a curved track to guide the apron beneath the stage floor at each end of the carriage path, much like the stage sliders worked to expose the openings for sinks and rises. This stiff apron was to be pushed and pulled by the treadmill carriage in way much like the working of a roll-top desk.

It is doubtful that the Williams device was ever employed, at least in its patent form. Running the treadmill carriage slots up and down stage would have necessitated cutting many longitudinal supports which in most stages would require extensive reconstruction of the stage floor. Moreover, the device illustrated in the

9 Cutting the carriage slots from stage right to left would have followed the lines of the sinks and bridges and thus would result in less rebuilding of the stage than would cutting in any other direction; indeed, if bridge slots were present and wide enough, the treadmill carriage tracks could be designed to fit existing openings. Upstage-downstage
Fig. 16 Illustration from
Adrian William's British patent 12,230

Note the flexible apron at H and e in the lower illustration. Fig. 3 in the patent illustration is a section view of the treadmill carriage; the wheeled treadmill slats work in slots d let into the side of the treadmill carriage.
Fig. 16 Illustration from Adrian William's British patent 12,230
Williams patent shows no restraints for the running horses. Such an arrangement would require a treadmill motor drive, not specified in the patent description, and might easily allow a horse to run off the end of the treadmill into the stalls or orchestra pit. Such an accident, similar to that at the Broadway Theatre, New York, in 1856 (which did not involve the use of a treadmill), would surely in this latter more sensitive age have marked the finish of the horse-bearing racing machine on the theatrical stage.  

Devices other than treadmills could be employed to stage race scenes with horses running continuously in view of the audience. The London Coliseum, for instance, was equipped with a concentrically sectioned revolving stage which was, on occasion, used as a running platform for tracks, however, would have cut through most of the longitudinal supports beneath the stage.


11 In his attempt to reserve right to all possible permutations of the racing machine effect Burgess patented some curious variations. U. S. patent 471,127, granted 22 March 1892, shows a device designed primarily for inexpensively simulating a footrace. This device employed a running track composed solely of a series of closely spaced rollers with no covering belt, a surface which would surely have produced uncertain footing. The patent also notes that it was conceivable to substitute one very large roller for the series of small cylinders shown in the patent illustration, but this method, obviously impractical, would have required a huge roller set to a great depth beneath the stage.
horses. The Derby (1905), for instance, made such use of the revolve, on one occasion with disastrous results, but it is not certain that the revolve was used with other animated scenery such as moving panoramas. Several patents, however, do illustrate racing machines which employ revolving discs in conjunction with moving panoramas. There is no indication, however, that these patented revolving disc machines were ever realized.

The first of these patented devices seems to be that illustrated in U. S. patent 423,372, granted to F. M. Chapman 11 March 1890. This device (Fig. 17) employed a horizontal treadwheel in the form of an annular disc, the ring shape being employed to reduce weight and conserve material. The runner ran upon the treadwheel, its stay-line brought offstage to a securely fastened rope block. The illustration shows the block rigged to provide a mechanical advantage of at least two to one. It was intended to be used to adjust the position of the runner on the disc, and if a horse were to be run, the stay-line probably would have been carried to a winch to provide additional advantage.

12 The horse, while attempting to run on the curved track, fell and was severely injured. "Animal Actors at Home," The Illustrated London News, 15 Sept. 1906, p. 367.

13 C.f. Burgess's U. S. patent 471,126; Chapman's U. S. patent 423,372; and Burgess's U. S. patent 286,709. Comparison of many patents for stage appliances indicates that the vagaries of the patent process prior to the turn of the century allowed many potential infringements, the defence of which would seem to lie in the claim that unique combinations of devices were employed.
Fig. 17 Illustration from
F. M. Chapman's U. S. patent 423,372

The illustration above is a front elevation of the apparatus; below is a plan view. Sheet 2 of this patent (not shown) displays sectional views of the apparatus.
Fig. 17 Illustration from F. M. Chapman's U. S. patent 423,372
A moving panorama is shown integrated with the disc, erected across the disc's diameter parallel to the proscenium. The panorama was to be gear-driven by a cogged rim on the periphery of the treadwheel disc, the running horse providing the power, and idler gears were to be inserted between the treadwheel and panorama drum gears to cause the panorama to move in the appropriate direction.

As a stage device for simulating a horse-race with several animals—a not-forseen application in the patent application—this machine would have several defects: first, the stay-line would be visually obtrusive; second, individual treadwheels would be necessary for each animal, lest the slower animal be cast to the rear and run off the ring; and third, because of the arc of the ring-shaped running surface, the position of the animals could not be adjusted to any great degree. This device, however, seems to have been devised with a single animal in mind, and the stay-line employed less for adjustment of the animal's position than to keep it from running off the disc.

Neil Burgess received U.S. patent 471,125 for a somewhat similar device 22 March 1892. This device (Fig. 18) employed concentrically mounted, horizontal, annular treadwheels to provide multiple running surfaces for an unspecified race effect (for purposes of illustration a footrace was chosen for the patent drawings). The runners were tethered by rope stay-lines carried offstage to winches which were to be used to adjust the positions of the
Fig. 18 Sheet 1 from Burgess's U. S. patent 471,126
Fig. 18  Sheet 1 from Burgess's U. S. patent 471,126
runners upon the treadwheels. An unspecified backing was to be used upstage of the device. According to the patent claim, the unique quality of this device is that, unlike the belt treadmills, it worked entirely in a horizontal plane and therefore might be less expensive and difficult to employ. A fanciful elaboration of the device is illustrated in the second figure of the patent illustration. Here the entire apparatus is shown born by a wheeled carriage placed beneath the stage. The purpose of this ungainly mechanism was to provide longitudinal movement of the entire treadwheel assembly across the stage.

Among the most complicated and ingenious of the patented racing devices were those devised by Claude Hagen for Klaw and Erlanger's production of Gen. Lew. Wallace's *Ben-Hur*. The devices employed by Hagen, except for the trick chariot mechanism employed in Messala's chariot, are substantially described in U. S. patents 656,969, granted 28 August 1900, and 653,997, granted 17 July 1900. Respectively, these patents comprise the structures of the multiple panoramas of the amphitheatre scene and the unique multiple bands of its moving ground effect.

*Ben-Hur* utilized three interconnected, endless-belt panoramas (Fig. 19) set at oblique angles to one another to form a roughly semi-circular backing on which was painted a scene representing the interior of the amphitheatre at Antioch. This entire effect was motor driven from beneath the stage, and was rigged so that it and its associated
Shown above is a plan view of the panoramas and outriggers; note the dotted lines indicating the position of the side panoramas in their stored positions. Below is a plan view of the drive motor, belting, and gear transmissions beneath the stage.
Fig. 19 Sheet 1 from Hagen's U. S. patent 656,969
treadmills, horses, and chariots could be placed in operating position in less than eight minutes.

Both drums of the center panorama were belt driven from beneath the stage. A motor, mounted center beneath the stage, is shown driving a speed reducing double pulley on a countershaft by means of a belt transmission (Figs. 19 & 20); a twisted belt transfers the motion from this pulley to a vertical shaft positioned at center stage directly beneath the center panorama. From this shaft two belts carry the movement to the axles of the panorama's end drums, one belt running to the stage right drum, the other to the stage left drum. All of the panorama end drums are equipped with toothed gears mounted at the bottom of their axles. Idler gears, meshing with both the center and side panorama drum gears, transmit the motion of the center panorama to each of the side panoramas. Thus the entire set of three panoramas was driven by the movement of the center panorama without the need of additional, complicated machinery.

The panorama cloths were secured to durable, narrow belts, probably made of leather, at top and bottom edges; these belts took the strain of turning about the drums off of the painted cloth itself and prevented the backing from showing wrinkles and tension lines. By means of periodically spaced wheeled carriages the upper belts were suspended from grooved panorama tracks which guided and supported the cloths between the end drums. Each carrier bore two pairs of wheels, the belt hanger suspended from the
Fig. 20 Sheet 2 from Hagen's U.S. patent 656,969

Shown is a front elevation of the three panoramas. Sheet 3 (not shown) is a detail of the panorama drums and gearing.
bar connecting them (Fig. 21). The wheels of each pair were shaped as opposed sections of cones, so that they would center themselves automatically in the beveled grooves of the panorama tracks, and were equipped with ball bearings in order to reduce running friction.

The center panorama track was suspended from large outriggers at its offstage ends, and the side panorama frames were hinged to these same outriggers in such a way that they would be folded against the front surface of the center panorama for storage (Figs. 19 & 21). At their downstage ends the side panoramas were supported by hinged, rigid stage-jacks which also folded away for storage. The upstage drums of the side panoramas were mounted on the outriggers immediately downstage of the center panorama drums so that when the panoramas were in operating position the audience would not be able to observe the space between them. With appropriate lighting, the three panoramas were to give the effect of a continuous, unbroken background.

The mechanical arrangement of the panoramas is clear from the patent, except that the method of coupling the panorama shafts above stage with their drives beneath the stage is not detailed. A number of suitable couplings, however, would have been very easy for any machinist to devise.

It should be noted, however, that since the panoramas were endless belts carried about their drums by friction with the drum surfaces, they would be subject to slippage,
Fig. 21 Sheet 4 from Hagen's U. S. patent 656,969

Side elevations of the panoramas and outriggers. Note the grooved track 20a in which the panorama hangers roll. A wheeled panorama hanger is illustrated at fig. 6, its ball bearing construction shown in the cut-away section.
Fig. 21 Sheet 4 from Hagen's U. S. patent 656,969
and there would be some difficulty in keeping the movement of the individual cloths synchronized. (Separately powered cloths, however, would have been much more difficult to synchronize.) If any recognizable item, such as an imperial box, for instance, were to be painted on the panoramas, the panoramas would have to be adjusted so that when the box disappeared from one cloth by turning about an end drum to the back of the belt, it would at the same time appear on the next. In order to achieve this progression of the painted image, the lengths of the panoramas must be taken into account. In the patent illustration (Fig. 19) the center panorama is almost exactly twice the length of the end units, therefore scenery painted on the end panoramas would appear twice as frequently as scenery painted on the center unit. Where the painted scenery was sufficiently regular and indistinct, such inconsistent reappearance would not be a problem. Where the backgrounds were distinctively varied, the only solutions apart from ignoring the problem, would be to drive the individual cloths at varying speeds to compensate for their differing lengths—a solution not universally feasible and in its own way detrimental to the wanted illusion\(^\text{14}\)—or to adjust the lengths of the cloths by

\(^{14}\) In the case of the Hagen patent illustration, for instance, driving the end panoramas at one-half the speed of the center panorama would only synchronize two of the three panoramas. Not only would the end panoramas apparently move more slowly than the center panorama, but the distinctive scene at some point would appear on both of the side panoramas at the same time.
means of folds and rollers so that the total lengths of each cloth would be equal. 15

Hagen's U. S. patent 653,997 (Figs. 22 & 23) details the mechanism for producing the illusion of the amphitheatre track passing beneath the hooves of the horses. This was accomplished by working a series of numerous earth-colored endless belts across the stage between each of the running horses. These belts, very much resembling extremely low panoramas, varied in height, being taller according to their distance from the proscenium. These low belts were all driven from one main motor and shaft, and, when viewed from the angle of the audience, gave the illusion of the ground in motion.

The patent illustration (Fig. 22) shows the motor-driven main shaft placed beneath the stage perpendicular to the curtain line. Twisted belts are used to transmit motion from the main shaft to horizontal pulleys secured beneath the stage floor at the stage right end of each earth-colored belt, the stage right end drum of which is mechanically coupled to the horizontal pulley beneath the stage. The

15 See such an arrangement in a device for an advertising effect in fig. 5 of U. S. patent 1,841,844, granted to J. Norworth, 19 Jan. 1932. Undoubtedly the need to conserve space and the necessity of keeping the mechanism simple and drag free precluded Hagen's employment of folded panorama cloths to make the lengths of the individual panoramas equal. Note that to prevent simultaneous appearance of the same scenery on each endcloth, the total length of each panorama would have to be three times as long as the length of the longest visible section.
Plan view of the panorama and moving ground effect. The motor and drive shaft for the earth-colored belts are shown in the cut-away of the stage at left.
This illustration shows the structure of a moving belt drive cylinder for the moving ground effect. Figure 6 shows the bayonet coupling used to join the above-stage drum with the drive pulley below; figure 5 is an end view of the center stage guide pulleys.
intermediate belt pulleys on the main drive shaft decrease in diameter the further they are positioned upstage, thus reducing the speed of each further upstage earth-colored belt and thereby enhancing the illusion by means of differential motion (i.e., the further away that scenery is from a moving observer, the more slowly it seems to be visually displaced). Since these scenic belts had to be quickly placed and later quickly struck from the stage, their drive cylinders were equipped with a bayonet joint which was passed through a hole in the stage floor to make a temporary coupling with the horizontal pulley mounted beneath the stage.

On the stage surface the scenic belts were brought around end drums (Fig. 23), barrel-shaped in section in order to cause the belts to center themselves when in motion, and then passed between two close-set idler cylinders whose purpose was to bring the front and back surfaces of the belts close together so that the audience would not be able to discern the gap between them or see the inside surface of that part of the belt running in reverse direction across the stage. Each assembly of end-drum and idler cylinders was mounted between two metal plates, forming a kind of pulley-block, and was capable of being secured to the stage floor by inserting a metal pin into the floor through a hole in the lower plate. The length of the earth-colored belts stretching across the stage made necessary the use of guide wheels at center stage to keep
the belts from flopping over. These guides were short lengths of inverted T-bar bearing sets of two pulleys on the front and back sides. The scenic belts were passed between the sets of pulleys, the pulley flanges securing the belts at top and bottom edges.

None of Claude Hagen's patents pertain to the chariot mechanisms used in Ben-Hur (the Ben-Hur chariots have been adequately described in various journals, and are treated herein in chapter four), however, U. S. patent 666,714, granted to David I. Towers 29 Jan. 1901, details various mechanisms for four-horse chariot machines in which the treadmills run perpendicular to the proscenium. The orientation of these machines, and their similarity to the devices of Neil Burgess's earlier patents, lead one to suspect that Towers's device may have been based in some degree upon the four-horse chariot machines Burgess employed in The Year One. 16

Towers's patent describes a device composed of two four-horse chariots—one treadmill for each horse—mounted in elevator frames which were suspended beneath the stage by rope lifting lines and brought to the stage surface when the device was to be employed (Fig. 24). The horses were to

16 The Year One also employed two four-horse chariots running on a line perpendicular to the proscenium. Moreover, one David I. Towers, probably the same as the holder of U. S. patent 666,714, was both a manager for The County Fair and one of the witnesses for the application for Burgess's U. S. patent 471,127. See ch. II, p. 58.
The lower illustration shows a side elevation of the treadmill carriage elevator; center is a plan view. Note the dust tray at 5, powered by the hand-cranked blower 8, and the diagonally placed panoramas at 3. The upper illustration shows projectors 21 used to project a moving background on projection screens 20; the steam pipe for concealing their juncture is at 6.
Fig. 24 Sheet 1 from David Towers's U. S. patent 666,714
be tethered to the treadmill frames or to the chariots behind, which were in turn secured to the treadmill frame. At front and back of the frame flexible aprons, tensioned by hanging weights, were employed to conceal the gap in the stage in front and back of the treadmills and to conceal the track upon which the treadmills moved. When it was necessary for a chariot to pull ahead, the chariot stay was to be let out, allowing the chariot to move.

The unique feature of this device is that it was intended to be employed either with a set of two panoramas placed at left and right of center on diagonals to the proscenium, the gap between the panoramas to be concealed by dust blown from a perforated pipe placed between the panoramas, or with images of receding scenery cast by two cinema projectors upon two screens set on diagonals to one another, their juncture being obscured by means of steam from a perforated steam pipe placed on the floor between them.

The second sheet of Towers's patent illustration (Fig. 25) illustrates a trick chariot device somewhat like that employed in Ben-Hur. This illustration shows a chariot resting upon a collapsible frame rigged to tip the chariot onto its axle when a wheel is lost. The chariot tongue is rigged with a pipe through which air can be forced to flutter the dress and hair of the driver. One of the chariot wheels is removable, and is attached to the chariot axle by means of a simple clutch which can be operated by
This illustration shows the trick chariot mechanism. Fig. 6 is a detail of the hub of the spring loaded trick wheel; note the guide rod 35, and the folding chariot supports 28, 29 & 30. As drawn, it is impossible for the chariot to tip after the trick wheel is pulled.
Fig. 25  Sheet 2 from David Towers's U. S. patent 666,714
the "driver" of the chariot. The clutch is a bent lever, one end terminating as a pedal in the chariot body, the other in a shallow fork riding in a groove cut into the hub of the chariot wheel. A compressed spring within a hollow in the axle presses against the wheel hub. When the driver presses the foot pedal, the fork is withdrawn and the spring propels the wheel from the axle. A bent iron rod, one end secured to the stage and the other in line with the wheel's axle hole, guides the wheel in its fall in order to prevent it from rolling into the audience.

Many details of this trick mechanism are not specified in the patent, and a main part of the device, as it is drawn in the patent illustration, is impractical. The collapsible frame elevates the chariot wheels slightly above the surface of the treadmill carriage, and some unspecified drive is to be used to turn the carriage wheels. As it is drawn, the collapsible support mechanism is inherently faulty. The floor, tie rod, and chariot frame are hinged together by the vertical support bars. Together these form two hinged parallelograms which will not allow the chariot floor to assume any position other than one parallel to the stage. When the trick wheel is detached and the trip-line to the folding frame pulled, the chariot will settle only until the remaining wheel contacts the treadmill carriage surface, and the chariot body will remain level. Obviously the device as drawn was not constructed before the patent was submitted, and needless to say, a similar but mechanically practical
mechanism was employed by Claude Hagen for the *Ben-Hur* effect.\(^{17}\)

\(^{17}\) See ch. IV for a treatment of the trick chariot mechanism used in *Ben-Hur*. Almost all accounts of the *Ben-Hur* race indicate that Messala's chariot loses one wheel, in accordance with Wallace's novel. Saxon, however, recounts that two wheels were lost, and if this were so then Towers's device, using two trick wheels and the collapsible support shown in the patent drawing, might have been practical. Since no other source corroborates his account, Saxon is probably in error. A. H. Saxon, *Enter Foot and Horse* (New Haven, Conn.: Yale Univ. Press, 1968), p. 225.
CHAPTER IV

THE BEN-HUR MACHINES

The numerous and spectacular scenes of The Year One were unable to rescue that production from the burden of an absurd script and a star-producer determined to make the extravaganza a vehicle for his own specialty. The houses attracted by concerted advertising and published testimonials were insufficient to meet the expenses of that vast production, especially when its producer was encumbered by the previous expense of theatre remodeling. The Year One, sumptuously clad and decked out with supposedly antiquarianly correct scenery, folded in just six weeks. Even the chariot race, what should have been a decided novelty when all its horses chose to run, was insufficient attraction to keep the production alive; how unlike The Year One was the experience of Klaw and Erlanger's production of Ben-Hur.

The phenomenal growth in sales of General Lew. Wallace's "tale of the Christ" in the decade following its publication in 1880 indicated that it would be a valuable property for stage presentation, and the rights to present it were eagerly sought. However, nineteen years elapsed
between the novel's initial publication and its translation to the stage. Although Wallace had been petitioned frequently to authorize a version for the stage, he persistently declined, fearful both of the impropriety of countenancing a stage play involving impersonation of the Christ figure, and convinced of the stage's inability to realize the scenes of spectacle and local color that enlivened his work. Abraham Erlanger, however, who had become the leading figure of the Theatrical Syndicate, eventually proposed a production to Wallace and to Wallace's publishers, Harper Bros., that would quell Wallace's reservations. Erlanger proposed a scenic extravaganza, faithful as far as possible in scene and dialog to Wallace's text; the problem of avoiding presentation of the Savior to be solved by utilization of a powerful spotlight, the shaft of light to present the divinity.

Erlanger's proposals, supported by scenic models and assurances of propriety, were accepted, and William Young, a midwestern dramatist who previously had scored a signal success with a romantic comedy titled *The Rajah* and had

1 *Ben-Hur* did appear on stage prior to the Erlanger production in the form of tableaux, one of which was contrived by Wallace himself. Irving McKie, "Ben-Hur* Wallace (Berkeley; University of California Press, 1947), pp. 173-76.


3 McKie, p. 176.
written several verse dramas, was enlisted to adapt a script. The well-known scenic artists Ernest Albert and Gros were commissioned to prepare scenery based upon the descriptions in the novel, and the firm of McDonald and Hagen was commissioned to devise machinery for the scenes of the chariot race and the wreck of the trireme Astrea. By the time of the opening in November of 1899, Erlanger had invested $75,000 in the production, $15,000 on the treadmills alone.4

Failure of a production of this magnitude could have been catastrophic to its producers. The size of the production, the complexity of the machinery, and the difficulty of integrating a company said to have numbered up to four hundred, required that six weeks be spent in rehearsal; of these, two weeks were spent in dress rehearsals, at that time a very unusual practice on the New York stage.5 The popularity of Wallace's novel and the amount of pre-production interest shown by the public, however, assured that the enterprise would be a success, but

4 Ibid., p. 177. The costs of the production are variously reported and inconclusive: most frequently $15,000 is cited as the cost of preparing the race, a figure which may include only the cost of preparing the treadmills. "The Drama in New York," Leslie's Weekly, 2 December 1899, p. 443. Other reports are higher: a New York Telegraph clipping notes that on its first run in 1899, the chariot race alone cost $19,400. "'Ben-Hur' Begins its 18th Straight Season," New York Morning Telegraph, 6 November 1916, p. 14.

5 McKie, p. 177. Training the horses began even earlier, on 1 September 1899. "The Drama in New York," p. 443.
the magnitude of that success surpassed all expectations. The Klaw and Erlanger production was destined to play to crowded houses for twenty-one years—with a short hiatus for war and for dissolution of the syndicate—and was withdrawn only just before the introduction of the authorized film version. By its third season Ben-Hur was playing on three continents; it was destined to be performed over six thousand times on the living stage, and seen by an audience estimated at twenty million. Through this large audience, possibly the largest audience ever to witness a single production, memories of Ben-Hur and its chariot race have achieved legendary status, while the scenes and machines of The Year One have long been forgotten.

Much of the Ben-Hur chariot race machinery devised by Claude Hagen has been described in the patent chapter preceding. Examination of other accounts of the mechanism, especially press accounts, reveals numerous details unspecified in the patents, and clarifies the staging of the race. Unless otherwise noted, the following details of the

6 The Metro-Goldwyn-Mayer multi-reel version starring Francis X. Bushman and Ramon Novarro premiered in December 1925, but was preceded by three years of filming and a year of litigation regarding the film rights. The stage production of Ben-Hur saw its last performance in April 1920. The authorized M-G-M version was preceded by an unauthorized Kalem one-reel version in 1907, which was the occasion for a significant copyright action after which Kalem withdrew its film and paid $25,000 damages. McKie, pp. 186-87.

7 Ibid., 180-81.
chariot race mechanism are taken from *The Scientific American* (25 August 1900). 8

Like the previous racing plays, the *Ben-Hur* race scene was staged so that it began and ended with the horses still galloping; this was necessary both because of the difficulty of drawing Messala's chariot offstage so that the race could be concluded in view, and because of the impossibility of making the horses start and stop running at the same time without utilizing motor driven treadmills.

At the Broadway Theatre, setting the race scene, which was the principle event of act V, was said to require eight minutes, little enough time considering that the scene required the full expanse of the Broadway Theatre stage and that other scenery needed to be struck. Set-up of the race probably began during an intermission following act IV, immediately after striking the barge scene on the lake of the Orchard of Palms. Because the race scene required the full depth of the stage, set-up could not begin any earlier, and was continued through the first scene of act V. This scene, "Making the Wagers," although essential to the story line, also functioned as a carpenter's scene to conceal the action of stage hands upstage. The scene took place downstage in a band about ten feet deep behind the footlights; it consisted of a profile colonnade thrust on from

stage right and backed with a painted drop of the circus.

During the wager scene the treadmills were uncovered, and the chariots and stay rods set in place. The horses were then led in and harnessed by stable boys who remained with them until just before the scene began. The panoramas were swung in place and then tested to insure that they were in working order, all this activity being concealed by the noise of "Roman" and "Jewish" factions contesting on the other side of the drop. On cue from the stage manager, the treadmill brakes were released and the horses let run; as the stable boys departed the panoramas were cued. When all was in motion, a blackout was called and the drop scene raised; when the lights went on again, the race was seen in progress.\(^9\)

The conclusion of the race was staged similarly, but in reverse order. As Messala tipped from his chariot, which appeared to fall rapidly behind that of Ben-Hur, a blackout was called and a drop let down between Messala's chariot and that of Ben-Hur. While the drivers brought their horses to a halt, a process taking perhaps thirty seconds, a congratulatory crowd of supernumeraries said to number one hundred and fifty surrounded the chariot and horses of

Ben-Hur. A built-up structure representing an official box was pushed on from stage left, and the stage was set for lights to come up on a brief scene of celebration concluding the fifth act. An intermission followed, during which the race machinery was struck and the stage set for the beginning of act VI, an interior scene in the Palace of Hur.

The Ben-Hur race scene, despite its intricacy and immensity, was accurately described as a "combination of several effects, some of them old and many entirely new" assembled by Mr. Hagen. The main components, as in the earlier racing dramas of Neil Burgess and Charles Barnard, were moving panoramas and shifting treadmill carriages.

The panoramas were rigged as a group of three mechanically interconnected devices forming a roughly semi-circular backing substantially as described in Hagen's U. S. patent 656,969. They were driven from beneneath the stage by a five horsepower Lundell motor controlled from the stage switchboard upon signal-light from the stage manager. The engine was not self-starting, and required the assistance of an operator to set it in motion (Fig. 26).

According to The Scientific American, the dimensions of the Broadway Theatre panoramas were ninety-six feet wide by


11 Ibid., p. 119. At other times motors of other sizes are mentioned; no doubt the motor was changed to accomodate various electrical services and in order to substitute better equipment. At the Valentine Theatre, Toledo, for example, twenty horsepower motors were employed to turn the
Fig. 26 Cutaway rendering of the *Ben-Hur* race

Note the stagehand behind the panorama, stage right, pulling Ben-Hur's chariot carriage forward by means of a long-handled hand winch, and the stagehand below stage, filling the hopper of the dust blowing mechanism. Below stage center is the large motor which belt drives the center panorama. To left and right below stage are gear transmissions which impart the motion of the center panorama to the side panoramas. Note that to the right of the stagehand operating the dust machine is a motor which drives both the dust blower and the strips of the moving, earth-colored ground rows. Cover illustration from *The Scientific American*, 25 August 1900.
Fig. 26 Cutaway rendering of the Ben-Hur race
twenty-five feet high (obviously referring to the total
dimension of the unit), thus reaching high into the flies
and, with the tiers of the amphitheatre painted in receding
perspective, contributing to the appearance of immensity of
the scene. In operation they were driven at a speed of

panoramas during the 1902-03 season; and a press account
from the 1905-06 season notes that a ten horsepower electric
motor was used for the same purpose. "A Great Spectacle,"
Toledo *Times*, 18 March 1903, clipping in the files of the
Billy Rose Theatre Collection, the New York Public Library
[hereafter referred to as NYPL-ROSE], MWEZ+nc373, p. 9; and
"'Ben Hur' The First," clipping in NYPL-ROSE, MWEZ+nc20.736,
p. 43.

The sizes of the panoramas have been variously
reported: the Erlanger Collection pressbooks contain
clippings variously citing the panorama size as containing
36,000 sq. ft. of canvas, and as having dimensions of 25 ft.
high by 83 ft. wide for the rear panorama and 25 ft. high by
35 ft. wide for the side panoramas. The panorama cylinders
for these large cloths were stepped in ball bearings, and
iron brackets in the flies, secured by 3/4 inch iron rods
passed through the stage wall, took the estimated 10 ton
strain of the revolving cylinders. "A Great Spectacle" and
an untitled pressbook clipping for a performance at the New
Haven Hyperion Theatre during the 1902-03 season in NYPL-
ROSE, MWEZ+nc373, pp. 9 & 47.

Another clipping from the 1902-03 season cites the
height as 36 ft. 4 in. "'Ben Hur' From Parquet, Also From
the Wings," Minneapolis *Tribune*, 30 December 1902, in NYPL-
ROSE, MWEZ+nc374, p. 7. The Chicago *InterOcean*, on the
occasion of the 1905 Auditorium Theatre performances, noted
the dimensions as being 20 ft. high by 40 ft. wide for the
rear panorama. O. L. Hall, "A Night Behind the Scenes of
"Ben Hur,'" Chicago *InterOcean*, (dated by hand 5 February

Another clipping from the 1905-06 season cites the
dimensions as being 43 ft. between cylinders and comprising
36,000 sq. ft. of canvas, but does not specify to which
cylinders the measurements refer. "'Ben Hur' The First,"
MWEZ+nc373, p. 9. Some interpretation of these various
figures is necessary in that panoramas of various sizes were
probably employed during the long run of Ben-Hur, and the
dimensions were not necessarily accurately reported.
2,000 feet per minute (almost 23 mph). Since the mechanism occasionally got out of order, it was always tested immediately before the race, so that it would not spoil the effect by its failure.

The Scientific American illustration of the machinery of the scene (Fig. 26) shows the three panoramas similarly painted, thus obviating any need to synchronize their

Moreover, the dimensions may refer to the total dimensions of the panorama belts, or only to the dimensions of their front surfaces. A figure of 41½ ft. for the visible width of the rear Broadway Theatre panorama would be more in keeping with the scale of The Scientific American illustration (Fig. 26).

The speed of the panorama movement is also variously reported: although The Scientific American cites the speed to be 2,000 ft./min., later accounts lessen that figure. The Daily Mail reported the panorama speed at Drury Lane to be 1,200 ft./min., and an Erlanger pressbook clipping reported the speed to be 1,340 ft./min. Later accounts suggest that the speed might have been increased, but do not cite figures. "Staging 'Ben-Hur','" London Daily Mail, 3 April 1902, Daily Magazine, p. 7; and "A Great Spectacle," NYPL-ROSE, MWEZ+nc373, p. 9.

There is indication that the panoramas were driven at a faster rate than the treadmills, perhaps to enhance the impression of speed. A Boston Colonial Theatre program notes that the horses covered 1,320 feet at each performance, while 2,006 feet of panorama rushed across the stage. Such evidence is, however, inconclusive. Colonial Theatre, Boston, program for the week of 17 December 1900 in the program file in NYPL-ROSE, MWEZnc5722.

Smith, "The 'Ben-Hur' Chariot-Race," p. 47. In Boston, at the Colonial Theatre, "a nail of small size dropped into the slot where the travelers run ... and the whole panoramic view fell to the stage ... while the chariot race was in progress." "Getting Stage Ready," Montreal Gazette, 7 January 1907, NYPL-ROSE, MWEZ+nc368, n.p.
Another drawing, however, from the *Sunday World*, shows a background with varied and distinctive details which would have required that the panoramas were driven at different speeds or were of equal length if their junctures were not to appear distinctly incontinuous. The quality of the drawing, however, suggests that the background might have been more the fancy of the artist than a studied rendering of the Broadway Theatre panorama (Fig. 27). A series of narrow endless canvas belts represented the moving floor of the arena, and are described substantially as they are in Hagen's U. S. patent 653,997.

The attention of the journalists seems to have been captured most by the mechanism of the chariots and treadmills. When first produced at the Broadway Theatre, *Ben-Hur* employed two four-horse chariots, the horses carefully selected to match the descriptions of the horses

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17 The moving ground rows were added to the effect in March, 1900. "'Ben Hur' Race Improved," New York *Journal*, 9 March 1900, NYPL-ROSE, MWEZ+nc365, p. 23. By 1905 the mechanism for driving the panoramas may have been integrated with the mechanism for driving the moving ground rows, and may have been driven by the same motor. Hall, p. 65.
Fig. 27 Section view of the *Ben-Hur* treadmill carriages

Because no other account details the use of inverted casters to support the treadmill carriages, it may be that this drawing represents only an artist's interpretation of the device used. Note the fan blades sketched in the body of the chariot and within the treadmill carriage, and the motor in the carriage frame which belt drives the concealed rollers which turn the chariot wheels. "Gen. Lew Wallace Writes of ... 'Ben Hur," New York *Sunday World*, 27 August 1899, p. 8.
Fig. 27 Sectional view of the Ben-Hur treadmill carriages
of Messala and Shiek Ilderim in Wallace's novel. The horses of each team ran upon individual treadmills which were rigged to turn in a movable frame, so that the horses could run in place, tethered to the frame and the chariot behind, the frame itself being shifted to alter the positions of the teams during the race. The arrangements were similar to those shown in David Towers's U. S. patent 666,714 and Neil Burgess's U. S. patent 423,171.

Each treadmill was an endless belt of rubber covered select, hickory slats forming a running surface two and one-half feet wide and ten feet long. These belts turned around end drums about eight inches in diameter, and were supported by a bed of four inch diameter idler wheels. In order to make the treadmills run quietly and smoothly, these idlers were surfaced with rubber tires and pivoted upon ball bearings, several of the accounts of the race noting that, unlike the terrific clatter of antecedent races, little was heard other than the pounding of hooves and the whir of the rollers. In a time when permanently lubricated bearings


19 Ibid. A more precise figure for the width of the belts is 27 inches. "'Ben Hur' From Parquet," MWEZ+nc374, p. 7; and "Old Tom in 'Ben Hur,'" Omaha Daily News, clipping from the 1902-03 season in NYPL-ROSE, MWEZ+nc374, p. 62.


21 Later versions of the mechanism did not always
were unknown, so many moving parts required careful attention lest a bearing seize and jeopardize the effect. One account, perhaps somewhat exaggerating the care needed by the machinery, has it that the entire assembly was disassembled and lubricated for each performance.22

At the Broadway Theatre the treadmill assemblies were recessed two inches below the stage surface, each treadmill belt being covered with planked tops until required for the race scene.23 The chariots did not ride upon the treadmill belts, which would have encumbered the galloping horses, but were mounted in a framework connected to the treadmill carriage frame behind the treadmill belts. The horses were yoked to the chariot poles, and were tethered to the treadmill carriage frames by two steel cable traces attached to the harness of each horse and to iron rods inserted into sockets between the treadmills and the chariot.24 The treadmills were equipped with brakes to prevent the horses from running before their cue when the panoramas were set in motion. These brakes were necessary devices, both for safety when harnessing the horses, and because once in place


22 Ellsworth, p. 247.
24 Smith, p. 46.
the horses seemed to anticipate their cue and struggled to run.25

Each group of four treadmills was mounted in a separate frame, the relative position of which could be shifted to make it appear that Juda Ben-Hur's chariot would pull ahead and win the race. There are differing accounts, however, of how this shift was accomplished. A strict reading of The Scientific American indicates that only Messala's chariot frame, which was upstage of Ben-Hur's, was rigged to move, and that the effect of Ben Hur pulling ahead and winning the race was accomplished by sliding Messala's chariot frame to the rear. Supporting joists were rigged directly beneath this chariot frame, and the frame was rigged to move fifteen feet. "Curtains," no doubt similar to the flexible "aprons" of Burgess's U. S. patent 418,372, were used to conceal the gap in the stage floor before and behind the treadmill carriage (Fig. 10).

The weight of the Broadway Theatre treadmill apparatus has been variously reported, some accounts claiming that each treadmill carriage weighed over a ton, and some as much as two tons. The aggregate weight of the treadmills and horses made necessary the shoring up of the Broadway stage to withstand both the dead weight of the apparatus and the impact load imposed by the many running horses, the impact load itself estimated to be equal to between two to six tons.

25 Ibid., pp. 47-48; and Ellsworth, p. 248.
additional strain for each treadmill carriage frame. The *Times* described the Broadway stage as having been reinforced "by a perfect labyrinth of beams, joists, and supports made solid by massive steel bolts" until it was capable of sustaining a weight of twenty tons.\(^26\)

The support structure and any rollers on which Messala's chariot frame moved are not shown in *The Scientific American* illustration. The illustration does show, however, the endless wire rope and winch, similar to that in Burgess's U. S. patent 418,372, used to shift Messala's chariot frame. The winch is shown in the substage to stage left, and the operators are shown onstage behind the stage left panorama, cranking the winch by means of a long handle which passed through the stage floor (Fig. 26). The text states that three men were used to crank Messala's chariot to the rear.

This single shift mechanism would keep Ben-Hur's chariot center stage, and allow Messala's chariot to fall behind. However, if Messala's treadmill carriage frame could be shifted only fifteen feet, the climactic destruction of Messala's chariot, occurring upstage, would probably have been obscured for some part of the audience. Nevertheless, such a mechanism could produce the effect of a slow gain by Ben-Hur, pulling ahead at the last moment, as

is consistent with the account in Wallace's novel.

Several accounts of the race, however, indicate that both chariots were equipped with shiftable treadmill frames. According to The Sunday World, the positions of the chariots were shifted twice during the race before the destruction of Messala's chariot and Ben-Hur's sudden spurt ahead. The Sunday World displays a drawing showing the chariot frame riding on inverted casters resting on brick piers beneath the stage (Fig. 27). The Times is in agreement with the Sunday World account of two movable frames, but in accordance with The Scientific American, has the frames working across the stage on rails. Being able to move both chariot frames would have enabled the scene to be staged with both chariots gaining and giving ground, or, if the tracks were arranged to be juxtaposed only at their extreme travel, to stage the scene so that Ben-Hur's chariot could be drawn further ahead at the end of the race and less obscure the view of Messala's ruin.

It is difficult to reconcile such differing accounts of the mechanism and the staging of the race in the first few months at the Broadway Theatre. However, during the long run of Ben-Hur the race was staged with several variations to accommodate the needs of the touring companies and to refurbish the scene by expansion of the effect, much as


occurred during the long run and tour of *The County Fair*.

Klaw and Erlanger went to great expense to insure that the mounting of the touring editions of *Ben-Hur* would not be inferior to that of the original New York run. Indeed, their usual practice was not to employ pared-down editions for the provincial appearances, but to use the scenery of the New York production, or later the London and Chicago productions, with the addition of duplicate scenery when it was necessary to leap-frog settings or machinery requiring lengthy set-up from one engagement to another. This practice, although expensive to maintain, insured that audiences would be presented with a production of consistent quality, and no doubt contributed considerably to *Ben-Hur*'s continuing success. As late as the 1916-17 season one

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29 Despite numerous claims to the contrary, *Ben-Hur* was not always presented as lavishly as it was on its first Broadway Theatre appearance. Pared-down versions did occasionally appear, either for reasons of economy or because some local stages, at which *Ben-Hur* was to make a short appearance, did not have the capacity to house the full production. Jackson Towne recalls such an appearance in Milwaukee during the 1908-09 season:

> "For some reason, Claude Hagen's panorama of the arena was dispensed with, and the horses, chariots, and charioteers performed against black curtains with strong spotlights thrown onto the stage from the wings. There were only two chariots, with two horses each. The horses galloped slowly forward, facing directly into the footlights, immediately remindful of the horses used to pull the smoking fire engines of the 1900's. The rollers of the two treadmills made a tremendous noise, filling the darkened auditorium with thunder enough to suggest the giving way of a gigantic log boom on the Columbia River. So noisy were the treadmills that the clatter of the horses' hooves, and the grinding of the wheels of the chariots, and the crack of Messala's whip were quite inaudible. After a few moments Messala's chariot slipped
finds the press favorably commenting that the producers did not stint in that production, but closely followed the elaborate settings of the original play.30

Pressbook accounts claim that Erlanger found it necessary to rebuild the stage of almost every theatre in which Ben-Hur played, thereby modernizing existing facilities in almost every major city in the United States, supposedly at an expense exceeding $1,000,000.31 Alterations frequently included clearing and enlarging the flies of the host theatres to accommodate the great amount of hanging and flying scenery, installing appropriate bracing to secure the upper ends of the panorama cylinders, and fashioning offstage areas to secure shifting space for the scenery that worked on the deck.32 To accomplish these and other necessary alterations, it was necessary to forward a team of fourteen to eighteen expert carpenters and mechanics into a slant, and the audience knew that the villain's chariot had lost its wheel, as in the story. Ben Hur's chariot then moved a little forward on its treadmill, and the curtain came down—amidst wild applause!" Towne, p. 66.


32 Hyperion Theatre (New Haven), 1902-03 season, clipping in NYPL-ROSE, MWEZ+nc373, p. 47.
two weeks in advance of the arrival of the production.\textsuperscript{33}

The stage floors of the host theatres usually had to be reinforced to withstand the impact load of the horses and the dead weight of the treadmills and chariots, variously estimated at twenty to eighty-five tons.\textsuperscript{34} For this purpose dressing rooms and other structures frequently had to be removed from basement and trap areas. To alleviate the expense of completely rebuilding the stage floors, "bridges," or trusses, were usually erected on pilings beneath the stage where they would support long rails on which the treadmill carriages ran. Thus only the loaded areas were strengthened.

The amount of scenery employed was staggering: a publicity account from the 1902-03 season declared "that there [was] more scenery in the Grove of Daphne than there was in Augustin Daly's famous production of 'Midsummer Night's Dream' in its entirety." It further noted that "the weight of the electrical apparatus, moving cyclorama, treadmills and horses in the Chariot race [was] over forty

\textsuperscript{33} "A Great Spectacle, NYPL-ROSE, MWEZ+nc373, p. 9.

\textsuperscript{34} As the number of teams increased, so did estimates of the stage loading: accounts of the Drury Lane performance variously cite the load to be 30 to 85 tons, and press accounts from the 1902-03 season cite the load to have been above 40 tons. "'Ben-Hur' at Drury Lane," The Sketch, 2 April 1902, p. 408; "Staging 'Ben-Hur,'" London Daily Mail, p. 7; hand-written publicity account on Euclid Opera House (Cleveland, Ohio) stationery, 1902-03 season, NYPL-ROSE, MWEZ+nc7418.
tons," and that the scenery for the entire production comprised over 140,000 square feet of canvas, the chariot race "cyclorama" alone accounting for 36,000 square feet of this total. The scenery of the original Broadway Theatre production, exclusive of the chariot race apparatus, was said to weigh 21½ tons.  

Transportation of the production required seven baggage cars and one stock car for the livestock; the production was expanded following the 1902 season, and by the 1916 season nine sixty-foot baggage cars and two Armes Palace stock cars were required.

When Ben-Hur appeared at Drury Lane in 1902, it was fitted out with new scenery and an expanded race involving four chariots and sixteen horses, thereby treating the audience to the equipage of the rival Assyrian and Byzantine teams, as well as those of Ben-Hur and Messala. The scenery, with the exception of act V, was credited to the Drury Lane artists Bruce Smith, R. and C. Carey, McCleery, and T. E. Ryan. The beginning and end of act V, scenes at the arena, were credited to McCleery, but the panoramas for the race itself were credited to Ernest Albert, suggesting that in this case background scenery

35 Publicity account on Euclid Opera House stationery, NYPL-ROSE, MWEZ+nc7418.
36 Colonial Theatre (Boston) program, December 1900, program file, NYPL-ROSE, MWEZnc5722.
37 "Staging 'Ben-Hur,'", p. 7; and "Great Preparations for New 'Ben-Hur,'" NYPL-ROSE, MWEZ+nc373, p. 85.
identical to the New York production but scaled to the Drury Lane stage may have been employed.\footnote{38}\ The English press touted the new scenery as being much superior to that of the New York production, and claimed that the restricted Broadway Theatre stage could not have accommodated the Drury Lane scenes.\footnote{39}

The race scene in \textit{Ben-Hur} occasioned reinforcement of the heavily mechanized Drury Lane stage just as it did on most other stages in which it played. The London \textit{Daily Mail} noted that sixteen steel pillars set into concrete foundations had to be installed to bear the load, and that Claude Hagen, the "inventor of the illusion," calculated the working strain on the stage to be not less than eighty-five tons (Fig. 28).\footnote{40}

After a four day delay occasioned by malfunctioning of the machinery of the race scene,\footnote{41} \textit{Ben-Hur} held the stage of Drury Lane from 3 April 1902 to 18 August 1902, only to make way for Arthur Collins's production of Cecil Raleigh's \textit{Mother Goose}.\footnote{42} Few critics were unimpressed by the race

\footnote{38} Drury Lane program, July 1902, program file in NYPL-ROSE, MWEZnc5722.

\footnote{39} "'Ben-Hur' at Drury Lane," p. 408.

\footnote{40} "Staging 'Ben-Hur,'" p. 7.


\footnote{42} "Mr. Arthur Collins," \textit{The Sketch}, 4 June 1902, p. 254; and "Heard in the Green-Room," \textit{The Sketch}, 16 July 1902, p. 527.
This impression of the race mechanism does not accurately convey details of the race machinery. Note the steel columns installed beneath the stage to bear the weight of the race apparatus. Fifteen columns are shown, but sixteen were actually installed. Also note that the panoramas are drawn as if they were similarly painted, and that Ben-Hur's chariot is carried by a singular tubular support fastened beneath the stage. This single support is described in later accounts, and was inserted into a socket fastened to the treadmill carriage frame, unlike in this illustration which shows the support fastened to the structure of the substage itself. "Staging 'Ben-Hur,'" London Daily Mail, 3 April 1902, p. 7.
scene, or unfavorably disposed toward an American spectacle on the boards of "Old Drury," and no doubt the success of the undertaking and the experience gained by the already expert Drury Lane mechanics contributed to the later success of the Drury Lane racing dramas The Whip, Good Luck, and The Hope. Moreover, the Drury Lane experiment furnished Klaw and Erlanger with a refurbished production for the American market.  

H. Bissing, chief electrician for the Drury Lane and a contributor of journal articles about electrical developments for the stage, was credited with the invention of a device—unfortunately unspecified in press accounts—which much improved the effect of the race scene.  

Although it is possible that he applied some new equipment to the panorama mechanism which enabled the panoramas to be driven at a greater rate, it is more likely that he applied electrically powered winches to shift the treadmill.

Klaw and Erlanger used the newer scenery of the Drury Lane production in their American engagements after the fifth season, and henceforth the race was usually staged with sixteen horses and four chariots. The U. S. press was divided regarding the quality of the scenery, most writers finding it more colorful and handsome than the original American scenery, but many declaring that it was gaudy and ill-suited to the "elevated" tone of the play. "Great Preparations of New 'Ben-Hur,'" NYPL-ROSE, MWEZ+nc373, p. 85; "'Ben-Hur' Revived in Louder Tone," New York World, 22 September 1903, p. 5; and "'Ben-Hur' Again in Glory," The New York Times, ca. Sept. 1903, NYPL-ROSE, MWEZ+nc373, p. 86.

carriages, which heretofore had been shifted by manpowered winches, and which, following the 1902-03 season, were usually shifted by electrically powered equipment. In some cases, however, later productions still resorted to manpower to winch the treadmill carriages across the stage, as was done during the Auditorium Theatre, Chicago, engagements in 1905.

The various Erlanger pressbook descriptions of the chariot race mechanism are generally in agreement, not a surprising circumstance given that they seem in most cases to have been compiled from the same press releases. The treadmill carriages, called cradles in the press accounts, were described as being twenty feet long and fourteen feet wide, and ran upon railways supported by an understage bridge structure so that the treadmill surfaces were two inches below stage level. This construction permitted the


46 Hall, p. 64.

47 The Erlanger pressbooks are in the Billy Rose Theatre Collection, New York Public Library, MWEZ+nc362-385. Note that the retention of invalid information in the press accounts from season to season is one factor which makes an accurate evaluation of the changes in the staging or mechanism of the race scene difficult.

48 In several accounts the treadmills are described as having tops projecting two inches above stage level; this is an obvious error in that such an arrangement would interfere both with the shifting of scenery and the movement of
treadmills and their tracks to be covered over with planking when they were not in use.

In some cases, however, it was necessary to erect the tracks and carriages on the stage surface, and to build a false stage surrounding them. This was especially true in cases, such as at the Wieting Theatre, Syracuse, in 1903, where the existing stage floor was a concrete and steel structure not easily reworked. Several photographs of the congratulatory scene concluding act V seem to show the chariot of Ben-Hur placed on such an elevation, but the surrounding crowd of supernumeraries obscures view of the treadmills and horses' feet.

The tracks of Ben-Hur's team were invariably closest to the footlights, since it was necessary to let in a drop between Ben-Hur's horses and the others to close the scene. The tracks for Messala's equipment were laid in the next "trench" upstage, and, when they were employed, the treadmills for the other teams were laid in one or more actors. Cf. "The 'Ben-Hur' Chariot Race," The New York Times, p. 18; and "Remarkable Mechanism," clipping from the 1902-03 season, NYPL-ROSE, MWEZ+nc373, p. 11.


50 New York Sun, 10 December 1916, clipping in NYPL-ROSE, MWEZ+nc23,409, p. 62.
trenches further upstage. A May 1903 account gives the size of the trench for Ben-Hur's chariot and team as being thirty feet long and eight feet ten inches wide.\(^\text{51}\) This width seems to be somewhat narrow for a team of four horses,\(^\text{52}\) but the length is generally in accord with the description of the original Broadway Theatre machinery in which the Ben-Hur chariot moved fifteen feet.\(^\text{53}\)

In the post-1902 press accounts the treadmills, if not identical, seem to be very like the original Broadway Theatre treadmills in construction. The treadmill belts were composed of twenty-seven inch long slats of hickory or birch some two inches deep and two or two and one-half inches wide, which were covered with rubber, or a rubber-canvas combination.\(^\text{54}\) An account from the 1905-06 season

\(^\text{51}\) "How the Ben Hur Chariot Race is Run!," Hartford (Connecticut) \textit{Globe}, 10 May 1903, NYPL-ROSE, MWEZ+nc373, n.p.

\(^\text{52}\) Given that the treadmill belts were 27 inches wide, as indicated in some accounts, a "trench" width of 8 feet would be 2 inches shy of the total belt surface width for four horses, exclusive of the space needed for belt clearance and the sides of the supporting frames themselves. "Old Tom in 'Ben Hur,'" Omaha \textit{Daily News}, 1903-04 season, NYPL-ROSE, MWEZ+nc374, p. 62.

\(^\text{53}\) Another account of the 1902-03 season indicates that both chariots moved 14 feet, that of Ben-Hur forward and Messala's to the rear. Hyperion Theatre (New Haven) clipping, NYPL-ROSE, MWEZ+nc373, p. 47.

noted that these belts ran upon bearing equipped idlers, some two hundred and twenty-five to each belt. This number represents an increase over the Broadway Theatre's one hundred and ninty-six idlers per belt, and is consistent with an increase in treadmill length from ten to twelve feet. These bearings, said to have been made to order at a cost of $2.25 each, enabled the treadmills to be turned with ease, and those used at the Auditorium Theatre were said to have turned easily under the pressure of the small finger. Each individual treadmill was twenty-seven inches wide and eight inches deep, and was bolted to adjoining treadmills to form a set of four. 55

Following the English production of 1902, four sets of treadmills were generally employed, although at various times press accounts record the use of two and three teams (Fig. 29). Occasionally, as at the Auditorium Theatre, Chicago, five teams were employed. 56

In 1905, at the Auditorium Theatre, Chicago, five chariots and twenty horses took part in the race. All the chariot treadmill carriage frames were shiftable, each being equipped with two offstage winches, one to pull the frame to the left and one to pull the frame to the right. This arrangement was probably a result of not being able to run

55 "'Ben Hur' The First," clipping from the 1905-06 season, NYPL-ROSE, MWEZ+nc20.736, p. 43.

56 Hall, p. 64; and "'Ben-Hur' On Big Academy Stage," New York Herald, 26 February 1907, p. 12
The treadmill carriages appear to be drawn by four lines, one connected to each corner of the treadmill frame, each line worked by its own handwinch. Two one-man handwinches are used to haul each carriage forward, and two more to haul it to the rear. Note that moving ground row strips were used, their end drums concealed by the box-like covers shown at the ends of the treadmill carriage slots. The stage manager, shown at lower left, is using an electromagnetic bell to signal the stage hands below stage. To the lower right of the illustration is a large motor and belting used to drive the center panorama, and beneath is another motor, used to drive the moving ground rows. The illustration does not show the transmission connecting the side panoramas to the central unit. "Mechanism is Intricate," Youngstown (Ohio) Telegram, 5 March 1906, NYPL-ROSE, MWEZnc.365, p. 51. This illustration commonly occurs in newspapers following the 1905-06 season.
PLAN SHOWING THE INTRICATE MECHANISM, INSTALLED AT THE PARK THEATER THIS WEEK.

Fig. 29 Ben-Hur treadmills post 1905
endless lines across the substage because of interference by the hydraulic pistons of the Auditorium's elevator stage.

The treadmills ran in "trenches" formed by lowering the stage elevators to their lowest position (fourteen inches below normal stage level) and building up the stage around the treadmills' paths. The treadmill carriage frames were set on low wheels, and were winched across stage in these trenches. At the beginning of the race, Messala's chariot was seen stage right, and Ben-Hur's forty feet behind at stage left. By the end of the two minute scene they have been drawn together for the wreck of Messala's chariot, the other three teams having only moved a short distance to simulate slight gains and losses. At the moment of the wreck Ben-Hur's chariot is winched suddenly ahead, and the wreck of Messala's chariot with equal speed to the rear.57

Although most accounts do not indicate that powered treadmill belts were employed, there is evidence that at some point the treadmill belts may have been driven by machinery. The evidence is, however, contradictory, and the casual nature of press accounts, coupled with the confusing amount of complex power-driven machinery employed, make it very possible that the press accounts of machine powered treadmill belts are in error. If powered treadmills were employed, however, it is likely that they were introduced on the change-over from the original American mounting to the

57 Hall, pp. 63-66.
English scenery brought back from the Drury Lane Theatre.

A New York Daily News account relates that master electrician Bissing developed an electrically controlled device to "whirl away" the "slack of the track" from beneath the horses' hooves, and a Toledo Times press account from the 1902-03 season is very explicit that powered treadmills were employed, noting that the treadmills "... are not run by the horses, as is generally supposed, but by the machinery below the stage." This machinery consisted of "two big dynamos of twenty horse power each ... used to run the treadmills on which the horses run, and to turn the panoramic scenery." This account further details that a "big handwheel" with two handles for the employment of four men was used "to start the race," and that in the event the motor failed, the race could go on by hand power. A train of toothed gears was used to multiply the force and transmit it to large flywheels from which belting transmitted the movement to the stage apparatus.  

Although the Toledo Times account and some others note that the treadmills were machine powered, it is doubtful that the mechanism described in the Times was used for this purpose. It might have been suitable for driving the belts of the stationary treadmills of the Byzantine and Assyrian "A Great Spectacle," and "A New Chariot Race Scene," NYPL-ROSE, MWEZ+nc373, pp. 9 & 69. Another account, however, explains that these dynamos were used to winch the treadmill carriages across the stage. "Wonderful Mechanical Devices," NYPL-ROSE, MWEZ+nc374, p. 121.
teams, but it would have been very difficult to use belt transmissions to couple power to the treadmill belts of Messala's and Ben-Hur's machines, which shifted their positions upon the stage. It is far more probable that the press accounts have confused this supposed treadmill belt drive mechanism with the machinery for driving the panoramas, which originally were driven by manually started electric motors and which employed a system of belt drives and flywheels similar to that described in the Toledo Times account.

Since machine-powered treadmills would offer the obvious advantages of forcing the horses to run on cue and relieving them of any strain of driving the treadmill belts, it is difficult to comprehend why they would not have been early employed. The reason seems not to have been because of a lack of mechanical expertise, but because of humanitarian and legal impediments: indeed, the Society for the Prevention of Cruelty to Animals had managed to prohibit the use of mechanical devices that could force the horses to run against their will. Such a prohibition of the use of powered treadmills may have been justified, since severe damage could have been done to the animals by driving them beyond their endurance or to the point where they might lose their footing on the moving belts and fall into one

another. There are, however, no reports that any accidents occurred to the horses employed in \textit{Ben-Hur}, although it is entirely possible that such accounts may have been suppressed by a cautious management.

The employment of powerful animals and complex machinery on stage frequently engendered doubts as to the safety of the enterprise: Neil Burgess carefully assured his audiences of their safety, and in all of his productions except, perhaps, in the case of \textit{The Year One}, there was very little danger that a horse might be cast into the audience. Indeed, the potential danger was more to the human and animal performers than to the spectators. There seems to be no record of actors or animals being injured during a racing play with treadmills. The potential for injury, however, existed. Indeed, Burgess occasionally had difficulty in securing proper replacements for his horses because of the owner's reluctance to let them be hired without guarantees of safety, guarantees apparently not forthcoming.\footnote{60} The larger the production, the greater the potential for danger. In England the opening of \textit{Ben-Hur} was delayed by malfunction of the machinery which so spooked the hastily trained horses that they became uncontrollable.\footnote{61} Indeed, even the normal operation of the racing scenes involved hazard; one account


from the 1905-06 season recounts that scarcely a performance
of *Ben-Hur* occurred without a horse casting a shoe during
the race to the hazard of the driver behind.62 The greatest
hazard, however, was to the horses, and it is for this
reason that machine powered treadmills do not seem to have
been employed in *Ben-Hur*.

The lack of power-driven treadmills, however, made it
impossible to motivate a recalcitrant horse, and there were
recurrences of spectacles similar to that of the opening of
*The Year One* in which part of a running team chose to
remain standing still. Thus, in 1903 at the New York
Theatre, a reporter observed "the Chariot race was found to
be as exciting as of yore in spite of the fact that
Ben-Hur's near horse sustained a trot throughout."63

As in *The Year One* and *The County Fair*, some time was


63 New York Theatre, clipping from 21 September 1903,
NYPL-ROSE, MWEZnc4624, p. 58. The *Times* was more explicit:
"The one slip of the evening was the now-celebrated
chariot race. Ben-Hur started third of four. There was
a thunderous rumbling of the mechanical rollers and a
great casting up of dust, but the four spokes of the
chariot wheel refused to revolve. Ben larruped his
firey Arabian steeds of Gen. Wallace's novel into
conniption fits, but though a King's ransom had been bet
on them . . . they ran like members of the Anti-Gambling
League. The nigh horse trotted, the middle horse slowed
down and stood still. The footlight charger ambled
peacefully and 'Star of the Desert,' . . . with the
hero's revenge at stake, a smile suffused his face as if
he were expectantly dreaming of a bunch of oats at the
*Times*, ca. September 1903, NYPL-ROSE, MWEZ+nc373, p. 86.
required to train the horses to the apparatus. Such training was critical, due to the unsettling effects of the crowd noise, the crowding of other animals, and the movements of the earth-colored ground rows and surrounding panoramas. Even the lighting posed special problems because unaccustomed horses would not run on the treadmills in the dark, and it required hundreds of repetitions before the horses would run in blackness.

The horses were carefully selected to match Wallace's descriptions: four bays, two whites, and two blacks (with an "understudy" for every two animals), and similarly appropriate animals when more teams were later employed. Training began several weeks before opening in a stable on East Twenty-fifth Street, where the horses were run on treadmills for one minute each day. In mid October they were brought to the Broadway Theatre, where working treadmills had been installed. There, it was said, Marc Klaw oversaw their daily run upon the belts. From this point their runs must have been lengthened until they were well accustomed to the device and surrounding panoramas, as

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64 To encourage the horses during the performance, they were let run for a short time in light before the blackout was called. "Some Animals of the Siâge," p. 7; and "Scenes Behind the Scenes in the Production of 'Ben-Hur,'" Indiana Gazette, ca. February 1904, NYPL-ROSE, MWEZ+nc365, p. 25.


well as the almost three minute duration of the scene. Contemporary accounts indicate that the horses grew accustomed to the task, showing no alarm when the close-by panoramas were tested, and displaying every evidence they anticipated and recognized their cue to run. Training continued several weeks into the run, a rehearsal of the race taking place every evening at six, but these were reduced to twice a week (unless a new animal was introduced) as the horses displayed greater equanimity.

The chariots used in Ben-Hur, like those illustrated in Towers's patent, had motor-driven wheels so that they would not depend upon power transmitted by the treadmill belt, drawing power ultimately from the horses and feeding back to

The duration of the race scene and the distance seemingly run are variously reported during Ben-Hur's tenure on the stage: one account had the scene lasting 3 minutes, during which the horses ran at a rate of a mile in just 2 minutes; a 1900 program note states that the horses covered 1,320 feet at each performance while 2,000 feet of canvas rushed across the stage. A note regarding performances at the Valentine Theatre, Toledo, in the 1902-03 season cited that the race effect lasted 1 minute 15 seconds, and a clipping from Minneapolis in the same season noted "the race is finished in one minute and forty-five seconds." The initial race at the Drury Lane was said to have lasted scarcely 45 seconds, but was later lengthened, and at the Auditorium Theatre, Chicago, the race was said to have lasted 2 minutes, "as long as a real race of a mile and a furlong." A few reports cited much shorter times, as short as "twelve full seconds" in a pared-down version at the Yosemite Theatre. Smith, p. 49; Colonial Theatre (Boston) program, 1900, NYPL-ROSE, MWEZ, nc5722; "A Great Spectacle," p. 9; "Ben Hur' From Parquet," p. 7; "The London Stage," p. 8; Hall, p. 64; and G. E. R., "'Ben Hur' As Seen by Two Pairs of Eyes," clipping in NYPL-ROSE, MWEZ+nc20,736, n.p.

Ellsworth, p. 248; and Smith, p. 47.
them any irregularity in the chariot's motion. Two different methods of driving the chariot wheels are shown in the illustrations.

By most accounts the chariot wheels were turned by electric motors hidden in the treadmill carriage frame. These motors, by means of a belt transmission, turned rubber covered rollers which formed a rotating surface beneath the chariot wheels. The chariot wheels were not true circles, but were cam-shaped wheels made irregular by flattening or applying bumps to their circumferences (Fig. 27). In this way the wheels caused the chariot body to jump and rock, furthering the illusion of a chariot hurtling along an irregular track.

The Scientific American, however, describes a mechanism (Fig. 30) more like that of Towers's patent, in which the chariot axles are belt driven by electric motors concealed within the chariot bodies. The Scientific American illustrates a trick wheel held upon its axle by means of a bent lever bearing against the flanged hub of the wheel. As in Towers's patent, the lever terminates as a pedal inside the chariot body so that the driver, by depressing the pedal, can release the wheel. A spring, in this case seemingly in the form of an elastic band looped about the end of a push rod thrusting against the wheel hub, is used.

Note the line, left, attached to the hub of the trick wheel which is used to guide the wheel offstage, and the motor in the chariot body which belt drives the hub of the trick wheel. Electrical connection to the motor was made by a flexible electrical cord plugged into a socket beneath the chariot by the right wheel. Also note the trip line running diagonally through the chariot body, which was used to toggle the legs which held the chariot body upright. "Some Stage Effects in 'Ben Hur,'" The Scientific American, 25 August 1900, p. 119.
TRICK CHARIOT IN "BEN HUR."

Fig. 30 Trick Chariot in Ben-Hur
to propel the wheel from the axle. A line attached to a swivel on the wheel hub is used to guide the spinning wheel offstage.

The mechanism seems clear enough from the illustration except that the wheel drive pulley is shown situated between the wheel and the flanged hub. One wonders how the wheel was to be freed from its belt drive when the retaining lever was retracted, and one suspects that some license was taken by the illustrator. If the axle, and not the wheel hub, was driven, there would have been no interference with the release of the wheel, and it is likely that the axles were driven since by this means both wheels of the chariot could have been turned easily and simultaneously by the same motor.

Although *The Scientific American* describes the wheel release as being triggered by a pedal within the chariot body, other mechanisms may have been employed later in the run. In some accounts, the wheel release mechanism was described as being automatic, set to release the wheel after a predetermined time, or more probably after a predetermined

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70 The propelling mechanism in *The Scientific American* illustration seems to be an elastic band; descriptions of the mechanism, however, only refer to powerful "springs" or "a strong spring." The David Towers patent of 1901 illustrates employment of a coil spring acting within the wheel hub. "Some Stage Effects," p. 119; Hall, p. 64; and U. S. patent 666,714, granted David I. Towers 29 January 1901.
number of revolutions. It is the use of such a mechanism that is used to explain one of the possibly apocryphal instances in which Messala was the winner of the chariot race. In one account this event occurred when the wheel release mechanism was actuated by mistake earlier than customary. When the stage manager hastily signaled to advance Ben-Hur's chariot before Messala's wheel was ejected, the flymen became confused and let in the drop for the scene at the end of the race. Thus the drop descended while Messala was considerably in the lead.

Although an automatic mechanism is mentioned in several accounts, there are no details about such a device, and its use would probably have over-elaborated the machinery for the scene. Even the actor-operated pedal to release the wheel may have proven to have been a liability as the actor lurched about within the chariot, and by 1905 the wheel,

71 "The Chariot Race from 'Ben-Hur,'" MWEZ+nc373, p. 21. A cartoon of a stagehand standing by a chariot wheel with a coil of rope is subtitled "Winding Up the Wheels;" from this one might construe that the wheel was screwed on a preset number of revolutions. "'Ben Hur' Behind the Scenes," The Boston Globe, 20 January 1907, NYPL-ROSE, MWEZ+nc365, p. 166.

72 "The Chariot Race from 'Ben-Hur,'" MWEZ+nc373, p. 21. A similar story relates that in an effort to bring Ben-Hur's chariot ahead before Messala's wheel was freed by the automatic mechanism, the electrician applied full power to the winches and the cable snapped with Messala a length ahead. Cf. "'Ben-Hur' is the Favorite but not a Sure Thing," clipping in NYPL-ROSE, MWEZ+nc373, p. 95; and Boston Transcript, 29 April 1926, clipping in NYPL-ROSE, MWEZnc4624, p. 95.
still spring loaded, was being disengaged by means of a
trigger actuated by rope from beneath the stage. 73

The Scientific American also illustrates a chariot tip
mechanism for Messala's chariot arranged to be operated by
the driver of the chariot (Fig. 30). The chariots did not
ride upon their wheels, but rested upon a metal supporting
frame. One side of Messala's chariot support frame, the
side on which the trick wheel worked, was equipped with
rollers at the base, and was hinged to collapse against the
chariot body. The frame was kept erect by an over-center
hinged brace attached diagonally between the horizontal
members of the frame and the folding legs. A trip line was
attached to the center hinge-point of the brace, the other
end fixed within the chariot. When the line was pulled, the
over-center brace would toggle, allowing the supporting legs
to fold and the chariot to tip. 74 Unlike Towers's mechanism
of U. S. patent 666,714, this mechanism would work. How the
trick wheel and tipping chariot might have been integrated
if floor rollers were used to drive the wheels is not clear,
since the use of floor rollers must have impeded freeing the
wheel from its axle. The devices illustrated in The
Scientific American, however, are compatible with each

73 This seems to have been the mechanism employed at
Drury Lane. "Staging 'Ben-Hur,'" p. 7; and Hall, p. 64.

74 The text, however, reads as if both wheels were
thrown off and describes Messala's chariot dropping upon a
yoke provided with strong springs (probably to reduce the
shock of striking the platform).
other.

Several ancillary devices contributed to the Ben-Hur race effect, all of them having been employed previously in other productions. Among them was the use of wind machines, illustrated in a stylized fashion in The Sunday World, to blow dust from behind the chariot wheels and to flutter the garments and colored ribbons of the drivers.

In The Scientific American illustration a stagehand is shown beneath the stage, stage-left of center, scooping vegetable dust into the hopper of a blower which fed the dust by means of the fanned array of fourteen tubes, center, through onstage outlets just behind the hooves of the horses. The vegetable dust, like that employed for The Garden of Allah, was carefully chosen to avoid the dirt and grit of real soil, which would have speedily done damage to the bearings of the treadmills and panoramas. The dust

A final device, the employment if which is mentioned in only one account of the race and is therefore doubtful, was a moving barrier possibly operated on the principle of Burgess's moving fence of U. S. patent 423,171. The Critic describes this device as "a low wall . . . in the front of the stage . . . which flows swiftly backward to heighten the illusion of the running horses. This is a continuous 'wall' of thin boards like painted shingles, worked with a big crank." Given the complexity of the effect, the use of such a wall, if kept very low so as not to obscure sightlines, is entirely feasible. It does not seem to appear in any illustration, however, and it is not impossible that The Critic may refer to another, different, scenic unit. Indeed, The Critic may be describing a preliminary version of the moving ground rows. Ellsworth, p. 249.

Note the stylized fan beneath the treadmill carriage and within the chariot body. "Gen. Lew Wallace Writes," p. 8.
blower is shown being belt driven from the same shaft which drives the canvas strips of the earth-colored moving ground rows.

Other accounts mention the use of steam, and of blowers placed offstage, such as used in The County Fair, to flutter manes and garments. A 1902 account of the Drury Lane production refers to another mechanism by which the revolving chariot wheels themselves churn dust out of a slot through which the wheels revolved. With such a mechanism, however, the dust would have been speedily exhausted, giving the impression of less furious movement as the race progressed. That such a mechanism was employed is problematical, and the columnist describing the device may have been ill informed. Individual fans set into the chariots themselves were also used to flutter the hair and garments of the drivers (Fig. 27). An account of the Chicago Auditorium Theatre performance in 1905 cites that six one-quarter horsepower motors were installed to operate the dust blowing devices and to move the skirts of the drivers. Whether these drove blowers feeding air


78 "Staging 'Ben-Hur,'" p. 7. A similar mechanism is found in British patent 498,669, granted to William H. Lytell, 30 May 1893, for a horse-drawn buggy working upon a treadmill which in turn was born upon a wheeled carriage drawn by a falling weight. In this patent the buggy wheels revolve through a trough filled with dirt and cast up dust.
through ducts routed to stage outlets, or were individual fans set into the chariots themselves is not specified.\(^{79}\)

There can be no doubt that the elaborate scenery and effects were major elements in the success of *Ben-Hur*, and indeed, they were the most noted aspects of the production in contemporary reviews. The vast scenic investiture of *Ben-Hur*, originally some fourteen scenes divided approximately evenly between the work of painters Ernest Gros and Ernest Albert,\(^ {80}\) was so great that all could not be stored on the Broadway Theatre stage, but required housing in an "L" shaped alcove in the adjoining alley. When in place, several of the scenes occupied nearly the full extent of the stage: the panoramas of the race scene swung in an arc ninety-five feet long across the stage, and the final scene on Mount Olivet, in which Ben-Hur's mother and sister were cleansed of leprosy, occupied the entire stage and stretched its canvas covered platforms, according to one account, "into the flies almost to the walls of the ...


\(^ {80}\) Ernest Albert and Ernest Gros were the painters of the original production. With the exception of Ernest Albert, who painted the scenery for the race scene, Drury Lane painters were employed by Arthur Collins to paint scenery for the Drury Lane, and this scenery was subsequently used in the United States. Occasionally new pieces must have been required and old scenery redone, and other painters are noted on *Ben-Hur* programs. In 1909 the name Oliver P. Barnard appears, and in 1912 and 1914 programs from the Forrest Theatre, Philadelphia, and the Oliver Theatre, Lincoln, Nebraska, note "scenery painted by Frank Platzer." Programs in NYPL-ROSE, MWEZnc5722.
theatre." The amount of scenery, which was increased following the Drury Lane production in 1902 and which on tour in 1916 required nine sixty-foot baggage cars to transport, was, however, not necessarily a measure of its quality. Indeed, to the modern eye, little of the scenery employed during the run of Ben-Hur achieves the degree of beauty or realism touted in contemporary reviews.

All the scenery was generally painterly and representative, primarily two-dimensional assemblies of drops and profile pieces with an occasional level or free-standing unit. Among the scenes attracting the most critical notice were "The Grove of Daphne" and "The Fountain of Castalia" in act III, all by Ernest Gros; and the spectacular scenes of the interior of the Roman galley, Astraea, and its wreck upon "The Open Sea" in act II, and the scene of the race in the circus at Antioch in act V, all by Ernest Albert. There was little use of cumbersome built-up pieces such as the platforming of the "Mount of Olives" scene because the increased difficulty of setting and

81 Ellsworth, p. 249.


Opening notices were generally effusive about the merits of the scenery, yet after 1900 newspaper accounts generally gave the scenery only perfunctory attention. When scenery was considered, the vast majority of notices concentrated upon the mechanism of the race machinery, no doubt reflecting the publicity value that management placed upon the race scene when preparing press releases.
striking such pieces would have overburdened the storage space and extended the duration of the production, already almost three hours long and requiring thirty-four minutes for intermisssions and the shifting of scenes.\textsuperscript{83} Indeed, there would have been little space to store much built-up scenery at the Broadway, where even the boat used on the lake of the "Orchard of Palms" had to be built with reversible prows because there was no room offstage to turn it around.\textsuperscript{84}

Many commentators, although generally impressed with the spectacle, were conscious that the production was more a series of scenic pictures than a comprehensive translation of Wallace's work to the stage.\textsuperscript{85} When Ben-Hur opened in New York, a writer for the \textit{Times} called it "panoramic, pictorial, musical, terpsichorean, religious . . . and only fitfully dramatic," but continued to declaim that "in many years [he had] seen no more beautiful and tasteful pictures than some of these painted by Messrs. Gros and Albert and contrived in every detail with all the skill the modern

\begin{itemize}
\item \textsuperscript{83} Colonial Theatre (Boston) program, December 1900.
\item \textsuperscript{84} Ellsworth, p. 247.
\item \textsuperscript{85} Young found it necessary to omit much of Wallace's novel in order to adapt it for the stage. Among the material deleted were such philosophical discourses as Wallace's lengthy exemplars of the efficacy of faith, love, and good works as exemplified by the Magi; several complications such as Messala's attack upon Ben-Hur in the palace of Idernee; and scenes of dubious propriety such as the scene of the Crucifixion. Numerous tableaus and scenes of concentrated action took the place of pages of dialog and description.
\end{itemize}
stage commands." The scenery, however, did not completely escape censure. The mechanical scenes of the wreck and the chariot race drew both adverse and favorable criticism: the same Times notice which lauded Gros and Albert's "beautiful and tasteful pictures" continued:

there are a few mature playgoers to whom mechanical devices of this sort no longer appeal. So far from being dramatic, such stage pictures are essentially the reverse. They destroy the very illusion they are intended to create in the minds of the sincere dramatic student. Horses galloping from nowhere to nowhere on sliding platforms in front of a quickly rolling panorama, painted canvas shaken from beneath, do not satisfy the imagination that receives the greatest enjoyment from the actor's art. But the multitude is always best pleased with toys.®

The Evening Post reacted similarly, but founded its criticism on grounds that the oarsmen in the galley technically could not propel the ship with "oars used at such an angle and with such insufficient leverage." While at first one tends to denigrate criticism based upon such observations as being but slightly associated with the essentials of the drama, one must also consider that in a play such as Ben-Hur, the appeal of which was very much visual and somewhat removed from fantasy, any noticable

87 Ibid.
departure from verisimilitude could not help but dispel the illusion of reality for some of the viewers. It is indeed possible that the action and machinery atoned for any other deficiencies in the wreck and race scenes; critical accounts, however, were mixed.

Regarding the action of the race, the Evening Post noted further imperfections:

As for the chariot race which is proclaimed as the great attraction of the show, that is, perhaps as near perfection as it is possible to get . . . . the device is employed with great skill . . . . so long as the observer looks only at the horses he may without much difficulty believe that he is watching an actual race. Otherwise the illusion is lost.\(^9^9\)

Unfortunately the Evening Post did not clarify its reservation, and one does not know whether it found the machinery or the painted scene at fault. The New York Dramatic Mirror observed that "the braces that held the horses and chariots were painfully obvious. The best part of the race scene was the swiftly moving panorama of the arena at the back and sides, an uncommonly managed illusion."\(^9^0\)

The varying accounts of the spectacle, however, all agreed that the mechanical effects were sure to attract the

\(^{89}\) Ibid.

masses and insure a success, and one can only conclude that the wonderment of seeing the race staged must have been a stronger incentive to attract an audience that any reputation the production might have had for spectacular scenic verisimilitude. Indeed, perusal of various photographs of the production is somewhat disappointing, given the glowing accounts of contemporary reviewers. The Mount of Olives seems palpably flat, its platforms certainly not "tower[ing] into the flies," and the "trees" dotting its hills appear miniscule in the photographs. Certain set scenes, the tent of Ilderim and the interior in the Palace of Hur, for instance, appear comfortably plush, their interiors filled with furnishings and draperies which provide texture and depth. Otherwise the scenes generally appear shallow and two dimensional. 91 No doubt much of this

91 It is difficult to establish the date and provenance of the scenery used in Ben-Hur from its appearance in photographs and newspaper illustrations. Very similar photographs of what seems to be scenery of the original Broadway Theatre production appear in pressbooks dated from 1900 to 1916. It is possible that much of the scenery was copied from season to season with only minor changes, but it is equally likely that preexisting publicity photographs were reprinted again and again, thus appearing in pressbooks from differing seasons even after the scenery was altered. Therefore it is difficult to ascertain what changes were introduced following Ben-Hur's appearance at Drury Lane and at the Chicago Auditorium.

Pressbook illustrations of "The Grove of Daphne" dated 1900 and 1916 exist in which the only discernable difference is that in the photographs labeled 1916 side masking pieces in the form of trees and bushes have been added to narrow the stage. Comparison of recognizably different photographs of scenes before and after the Drury Lane engagements (Ben-Hur appeared at Drury Lane in the 1901-02 and 1912-13 seasons) do not reveal substantial changes in the layout of
effect was due to the flat, frontal lighting employed to photograph the scenes, yet overall these once vaunted scenes appear tawdry to the modern eye.

The race scene in the circus at Antioch, like the race scenes in The County Fair and The Year One, was less a trompe l'oeil achievement of the painter's art than it was a triumph of the stage machinist. Unfortunately, as with all the previous racing plays, there seem to be no published photographs of the race in progress by which one can judge the quality of the illusion. No doubt this was in great part due to reluctance to employ flash light photography, a necessity if the horses and jolting chariots were not to appear merely as blurred images, and risk the danger that the flash of light might spook the horses, however well accustomed they might have been to the bustle of the stage and the scenic blackouts.

One suspects that the panoramas were not distinctly detailed, a suspicion confirmed by a Byron photograph of the race scenery, and that the attention of the audience was centered upon the events of the race, and not upon its

the scenes, but differ mostly in decoration. The black and white illustrations do, however, convey an impression that the scenery following the Drury Lane appearance, if not more colorful, displayed greater tonal contrast than before. That the Drury Lane scenery was more skillfully done or more vivid or harmonious is moot. Cf. pressbook photographs in NYPL-ROSE, MWEZnc4624, pp. 33 & 78; 42 & 80; 30 & 77; 40, 75, 76 & 79.
moving background.\footnote{Byron photograph \#8145 in NYPL-ROSE, MWEZ+nc366, p. 138.} Hillary Bell, writing for the New York \textit{Press} about one month after the opening of \textit{Ben-Hur}, was atypically unimpressed with the race, and unusually perceptive about the future of such elaborate stage illusions: the race, he wrote, was the "least excellent of the many incidents of the play," and would be deficient until some theatrical genius "evolve[d] a scheme to give harmonious motion to the foreground." Apparently Mr. Bell was not mindful of Burgess's downstage moving fence. The scene, Bell continued, also unmindful of \textit{The Year One}, would have been finer "if the furious steeds had galloped madly toward the audience." Bell concluded, "the only way to secure the exact sense of action for this incident [would be] to represent it by Mr. Edison's invention."\footnote{Hillary Bell, \textit{New York Press}, 3 Dec. 1899, in the clipping file, NYPL-ROSE.} Here indeed is early recognition of the increasingly exposed Achilles' heel of the spectacular theatre, for \textit{Ben-Hur} was among the first of numerous examples of the cinema's great ability to treat realistic, spectacular scenes with economy and fidelity, and it is perhaps not merely coincidental that Erlanger's long running production closed just before the premiere of the authorized film version of \textit{Ben-Hur}.\footnote{Nicholas A. Vardac, \textit{Stage to Screen} (Cambridge: Harvard Univ. Press, 1949), p. 195.}
It would be reasonable to expect that staged racing scenes such as that in *Ben-Hur*, with all their expensive and complicated machinery, might disappear with the advent of the filmed scene. That they did not is a tribute to the sense of wonder that they inspired. Nicholas Vardac, treating the advent of cinematic realism in *Stage to Screen* as the culmination of a one hundred and fifty year-old theatrical trend, considered the 1907 Kalem single reel version of *Ben-Hur* to be a landmark of both stage and screen production. It demonstrated that a rivalry had arisen between stage and screen production, a rivalry which Vardac believed prevented reaction against the excesses of romantic-realistic staging in the theatre and extended development of supra-realistic and spectacular staging in the theatre far beyond what might have been achieved without the competition of cinematic realism. Indeed, this observation in part explains the tenure of the munificent mounting of later Drury Lane autumn dramas, and especially of the racing dramas, in which wonderment at the sheer technical virtuosity of the staging played a significant part in drawing a devoted audience. The M-G-M *Ben-Hur* of 1925, however, conclusively demonstrated the screen’s superiority in such spectacular staging. At a reputed cost of $6,000,000, this extravaganza directed by Fred Niblo employed a twelve chariot race set before a section of

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95 Ibid., p. 230.
amphitheatre filled with thousands of extras. The thrilling collisions and massive chariot pile-up which concluded the race were events that the stage could have hoped but to approximate, and it was apparent that apart from its sense of immediacy, the stage had little further to offer such realistic spectacle apart from sound, color, and spatial dimension, advantages all too soon to be lost. Once the race appeared on film, the staged version would have appeared visually crude by comparison. Indeed, following a cold reception of *Ben-Hur* during the 1916-17 season a columnist chided:

> Was it that old Jack Frost had got to them on their way [to the theatre], or have the movies, with their hundred or more thousand dollar spectacles and with glorious Nature herself affording the stage settings, spoiled us for even the best that the craftsmanship of the spoken stage can produce? Judging from the apparent lack of appreciation of . . . even . . . the famed chariot race, shown last night it would seem so.\(^7\)

It would seem that after the advent of cinema, the value of stage racing machines lay in their use as simple spectacle, expensive curiosities to excite a sense of wonder and to create an aura of immediacy, and not in their contribution as a element of stage realism.

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\(^{97}\) "'Ben-Hur' at the Forrest," clipping from the 1916-17 season in NYPL-ROSE, MWEZ+nc23,409, p. 56.
CHAPTER V

THE RACING MACHINES IN FRANCE

The success of The County Fair racing machine at the Union Square Theatre inspired foreign imitation. In Paris, a variation of Burgess's device appeared in 1891 at the Variétés Théâtre in a year's end revue entitled Paris Port de Mer.1 Paris Port de Mer featured a three horse simulation of the races at Longchamps, a popular Parisian racecourse in the Bois du Bologne, as the final scene in the review, a position no doubt reflecting both a decision to save the most spectacular scene for last, and an awareness that some time would be required both to set and strike the effect.2 According to A. deVaulabelle, the French machine was devised by Emile Gaitton, an industrial engineer, and was realized by the theatre mechanic, M. Bruder, with the collaboration of Messrs. Solignac, Liepmann, and Brison,


2 "Spectacles and Concerts," Le Temps, 8 March 1891, n. pag.
engineers of the Popp Company.³

The Variétés device differed from the device employed by Burgess in several notable ways: the treadmills were motor driven; the horses were not restrained or fastened in place; and the panorama was not in the form of an endless belt, but was a scroll-type panorama, wound off of one cylinder and onto another, and having a physical and visually recognizable beginning and end.⁴ These differences had considerable influence upon the training of the horses and staging of the effect.

The newer continental stages, especially in France, were built with modular floors in which substantial openings could be created easily almost anywhere in the acting area. Traversing the stage were large, parallel, covered openings called rues; these alternated with smaller covered openings, the fausses rues or trappillons, and slots called costières which facilitated the movement of narrow, two dimensional scenery. The space beneath the stage floor was divided into one or more substages, and the supporting structure for the floors above was arranged parallel to the rues so that the space beneath the openings was not encumbered.⁵ This


⁴ Paul Laurencin, "La Course de Chevaux de la Revue 'Paris Port de Mer,'" L'Illustration, 14 March 1891, p. 244.

⁵ Georges Moynet, Trucs et Décors (n.p., 1893), chs. 1 & 2.
construction easily enabled a carpenter to arrange massive slots in the stage floor, and would have made easy the installation of treadmills at the Variétés Théâtre.

The three treadmills were installed downstage in the larger trapped sections known as *rues*. The dimensions of these treadmills were 93 centimeters by 9 meters (3 feet by 29.5 feet), corresponding to the space afforded by the openings of the *rues*. Prism-shaped ground rows painted in earth tones covered the *trappillons* between the *rues*.

Illustrations of the machinery suggest that the treadmills were set flush with the stage surface (Fig. 31). The belts were supported by a series of closely spaced wooden cylinders working on frictionless bearings. These rollers were 19 centimeters (7.5 inches) in diameter and spaced 20 centimeters (7.9 inches) on centers. The end drums were barrel-like cylinders formed of wedge-shaped staves mounted on a metal framework; these were 1.75 meters (5.7 feet) in diameter and spaced with axles 8 meters (26.2 feet) apart. 7 The maximum usable treadmill surface,

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6 Unless otherwise noted, the details of the Variétés racing machinery are taken from Moynet. Moynet's illustration of the machinery employed is almost identical to that in L' Illustration (Fig. 31). Moynet, pp. 329-36; and "Théâtre des Variétés," L' Illustration, 14 March 1891, p. 236.

7 According to Laurencin, a third drum, mounted in the second substage, was used to tension each of the treadmill belts by an arrangement much like that shown in fig. 33, used to tension the belt of the moving picket fence. This third drum does not appear in the cut from L' Illustration, but does appear in an illustration from de Vaulabelle.
At lower right is the electric motor used to drive the downstage treadmill belt. At upper right note an electrician at the control handle of one of the three rheostats which are used to adjust the speed of the treadmills. The box-like "basket-weave" devices just beneath the control handles are the rheostat coils. In front of the treadmills is the moving fence mechanism. The fence pulley at right is belt driven by an air motor not shown in the illustration. Down center is a tension pulley used to keep the picket belt taut. Although this tension wheel has been described as a screw tensioning device, no tensioning screw is shown, and tension may have been achieved by the weight of the tension pulley bearing down on the picket belt. "Théâtre des Variétés," L'Illustration, 14 March 1891, p. 236.
Fig. 31 Cutaway view of the *Paris Port de Mer* race scene
approximately four horse lengths, would hardly seem safe for unsecured horses running with no guide or restraint except their jockeys.\(^8\) Many rehearsals were therefore required to accustom the horses to running on these belts, the speed being gradually increased at each répétition.

The treadmill belts have been variously described, and it is possible, although unlikely, that their composition may have been changed during the run of the show. An article in *L'Illustration*, written shortly after the opening of the revue, describes them as being composed of a coconut fiber mat, similar to a floor mat but of a much heavier and closer woven texture.\(^9\) Laumann has described them as being

Comparison of the deVaulabelle illustration and that in *L'Illustration* suggests that the deVaulabelle cut is a corrupt version of that in *L'Illustration* in which the artist has confused the line marking the lower part of the moving picket fence belt with the line delineating the downstage edge of the lower section of the treadmill belt. The use of such tension drums would seem necessary to prevent spasmodic slackening of the belts during the thrusts of the horses' hooves. Laurencin, p. 244; "Théâtre des Variétés," p. 236; and deVaulabelle, p. 76.

\(^8\) Since the horses did not control the speed of the belts, it is possible that the impediment of a restraint might have disabled them from making the adjustments necessary to keep their footing on the belts.

\(^9\) Moynet describes the belts as being fabricated of "a thick [or dense] cellulose tissue, a belt packed with coconut fibers [tapis bourre en fibres des noix de coco], which assured a supple and rugged surface for the shoes of the horses." Moynet, p. 332. DeVaulabelle, writing almost 18 years after the event, described them as an endless belt of aloès, on which was sewn a thick, matted cover [tapis-brosse]. deVaulabelle, p. 77.
Note the group of stage spectators standing at right watching the race. Their stationary presence could not help but dispel part of the illusion of the race scene. "Théâtre des Variétés," L'Illustration, 14 March 1891, p. 236.
Fig. 32 View of the Paris Port de Mer race scene as seen by the audience
composed of wooden slats securely glued to a heavy canvas belt. This latter construction would, of course, have required a tough, flexible covering to provide traction and to absorb the blows of hooves.

Each treadmill was individually powered and controlled. The axle of each stage left end drum was equipped with a pinion gear and was driven directly by a large ring gear attached to a Gramme direct current motor. The current was supplied by batteries housed close to the theatre on the rue Feydeau, and was controlled by rheostats from a switchboard in the stage left wing. These motors consumed what would be considered an inordinate amount of power today, some 20,000 watts, but may have been efficient for their time. DeVaulabelle wrote that the belts were able to

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11 The reason for this gearing is not immediately evident. Examination of fig. 31 indicates that the gear train would operate to impart greater speed and less force to the treadmill belt, the pinion and ring gear arrangement affording approximately a four to one speed advantage. An illustration from deVaulabelle (Fig. 33) can be interpreted in the reverse sense. In that illustration the ring gear appears to be attached to the treadmill belt, and is much larger than the non-visible driving gear on the upstage end of the motor; this arrangement would reduce the belt's speed and increase the driving force. The deVaulabelle cut is poorly executed and somewhat confused, however, and is not to be trusted. "Théâtre des Variétés," p. 236, and deVaulabelle, p. 76.

12 This figure would not be so inordinate if it referred to the total power consumed by the three motors. Moynet, however, did not indicate whether he referred to each individual motor or to the three together: "They [the
attain a speed of 800 meters per minute.  

Individual control of each treadmill was necessary because in this effect the horses galloped unrestrained upon the belts, each at its own speed. Thus the belts had to be driven at different rates in order to keep the horses running in the middle of the belts at stage center. Before the race began, the jockeys rode their horses onto the belts, which then began to revolve slowly, and which were brought up to speed with the rise of the curtain. Close attention was required of the operators in order to prevent the running horses from "dashing themselves against the wall" if the belts should slow and they should run off the ends, or being thrown to the rear should the belts speed motors] consumed a current of 100 volts and 200 amperes, representing the energy necessary to illuminate 400 lamps of sixteen candlepower." Moynet, p. 335.  

Like the reported details of the Ben-Hur machinery, there are differing accounts of the details of the Paris Port de Mer mechanism. Laurencin estimated the maximum speed of the treadmill belts to have been 900 to 1000 meters per minute, the race lasting one and a quarter minutes; while deVaulabelle reported the speed to be 800 meters per minute, the race lasting about a minute. Moynet did not directly estimate the belt speed, but reported that the speed (of what he did not specify) attained 125 to 130 revolutions per minute, representing a race of 800 meters. He also recorded that the duration of the race was scarcely two minutes; and from this information one may deduce that the belt speed may have been as slow as 400 meters per minute (21.9 feet per second). In any case, the speed of the treadmills was much faster than the speed of the panoramas. Laurencin, p. 244; deVaulabelle, p. 77; and Moynet, p. 335.
Thus the devices for this effect differed greatly from those employed in England and the United States, in which the horses were maintained upon the treadmills either by means of concealed stays or by being harnessed to a fixed chariot or buggy. Having no physical constraint of the horses upon the belts had several advantages: it eliminated the set-up time necessary to harness the horses in place, and probably enhanced the illusion of horses running easily. Furthermore, it would not require that one or more of the treadmills be arranged on movable carriages in order to alter the positions of the horses, causing one of them to "win." All that would be necessary would be to slow the belt of the designated winner, thus allowing that horse to surge ahead of its fellows. These advantages, however, were not realized without hazard and the consequent need for constant vigilance on the part of the men regulating the speed of the belt.

The backing of the Variétés scene was a moving panorama of the scroll type, the visible surface of which, when the effect played, wound toward stage left. Upon it was painted a view of the stands and country around the Longchamps course. Because it was not an endless belt, the physical length of the panorama limited the duration of the race. The length of the panorama was specified at 93 meters (305

14 Laurencin, p. 244.
feet). If the race lasted one and a quarter minutes, as recounted in *L' Illustration*, the speed of the panorama would have been no more than a leisurely one and one quarter meters per second (4.1 feet per second), a speed probably just sufficient for slowly displaced background scenery. This slow speed probably facilitated manual drive of the panorama mechanism, which in one account of the effect was actuated by means of a man-powered winch in the wings. The panorama was painted with a view of the stands and surroundings of Longchamps racecourse as seen from the center of the course. Thus, while the scene played, spectators in the theatre would be treated with an abbreviated panoramic view of the track as seen from its center. It was probably because the scenery was familiar to the audience, and had a most recognizable beginning and end, that a scroll-type panorama was employed instead of an

15 It would have been incongruously slow, however, for close background scenery such as a fence or spectators just on the far side of the track. Burgess's double panorama (U. S. patent 418,372) would have answered this difficulty with some increase in cost and complexity. Moynet notes that the length of the Variétés panorama was about 100 meters, and that the duration of the race was about two minutes at maximum. According to these figures, the rate of panorama movement could have been as slow as .83 meters per second (2.7 feet per second). This rate of displacement would have been suitable only for far distant scenery. At any speed, however, the panorama would have had to have been unreasonably long to duplicate the countryside passed during an 800 meter race (apx. 2600 feet). Moynet, p. 335.

16 Laurencin, p. 244. Moynet, however, wrote that the panorama was moved by means of a compressed air motor. Moynet, p. 335.
endless sheet.

A third device, a movable fence similar to that employed in *The County Fair*, completed the effect. This fence was installed downstage of the treadmills, possibly in a *costière*. The primary difference between this and *The County Fair* fence was that the fence in *Paris Port de Mer*, instead of being driven by an electric motor, was driven by a compressed air motor supplied from the Popp central air station.

The fence was arranged as pickets attached to an endless belt running over wheels beneath the stage at left and at right. A third wheel, an idler wheel adjusted by means of a tensioning screw, was used to provide tension by pressing down on the center of the belt beneath the stage. As in *The County Fair*, a horizontal rail was used to keep the pickets upright as they passed in view of the audience. Whether these pickets passed between the horizontal members of a split rail, or were inclined so that they slid against a single rail is not clear. The compressed air motor which drove the fence was installed in the first substage, and a flexible belt was employed to transmit power to the end wheel at stage left (Figs. 31 & 33). When the scene played, the pickets were driven at approximately the same

17 Another part of the picket fence mechanism, not mentioned by Moynet perhaps because it was an integral part of the Popp motor, was a spinning ball speed governor, shown at lower left of center in the deVaulabelle illustration
At left note the Popp air motor with rotating ball speed governor used to drive the picket fence. Behind the fence drive belt is the motor used to drive the downstage treadmill; power is transmitted to a ring gear attached to the treadmill drum. The drawing is very confused: the artist seems to have confused the moving pickets with uprights supporting the stage, and what should be pickets appear beneath the stage, and show only in the area of the cutaway floor. Moreover, the lower section of the picket fence belt has been confused with the line delineating the downstage lower edge of the treadmill belt. Only two treadmills are shown. The illustration appears to have been based on the same source as that in L'Illustration, but has been reversed left to right. Note that in the cut in L'Illustration, the large ring gear is not attached to the treadmill drum, as is shown here, but is attached to the armature of the electric motor. A. deVaulabelle, La Science au Théâtre (Paris: Henry Paulin et Cie., 1908), p. 76.
Fig. 33 deVaulabelle's illustration of the Paris Port de Mer machinery
speed as the treadmills.

E. M. Laumann, writing about a Longchamps racetrack
effect at the Variétés Theatre, describes a further
innovation. Although his description is somewhat confused,
and the details of the effect he describes do not correspond
exactly with other descriptions of the mechanism used in
Paris Port de Mer, the main points of the effect are clear.
Because this innovation is not mentioned in other
descriptions of Paris Port de Mer, and because it is
unlikely that details such as Laumann describes would have
gone unremarked by others, and also unlikely that
alterations of the scene sufficient to reconcile the Paris
Port de Mer machinery with the scene described by Laumann
would have been made to the scene of a revue already in
production, it is probable that Laumann describes a scene
entirely from another production.18

(Fig. 33). The use of the governor indicates that the Popp
motors alone could not drive the picket belt at a stable
speed. Comparison of the deVaulabelle illustration and the
cut from L'Illustration suggests that the deVaulabelle cut
was based on the same source as that used in L'Illustration,
but has been reversed. The illustration used by Moynet in
Trucs et Décors was most certainly derived from that in
L'Illustration, or was also based on the same source. In
the L'Illustration cut, the belt extending diagonally from
the fence pulley at right probably engaged the air motor,
which is not shown in the cut. deVaulabelle, p. 76;
"Théâtre des Variétés," p. 236; and Moynet, p. 329.

18 Among other problems, Laumann's description has both
the horses and their treadmills moving from stage right to
stage left, an obvious error. He also describes the two
treadmills as moving in opposite directions. If this were
so, the stationary spectators would seem to keep pace with
In the effect described by Laumann, one of the treadmills was not used by the horses, but was occupied by actors impersonating scattered spectators watching the race. A stationary barrier separated this treadmill from the treadmill which bore the horses. As the race progressed, these actors would take their places on the belt in the wings, and would be carried across the stage in the same direction as the moving panorama. In this way the theatre audience would observe the race as if they stood in the middle of the oval track, turning to follow the running horses, and would also view live spectators passing by at the side of the track. Laumann recounts that, as might be suspected, many rehearsals were required to accustom the horses and actors to maintain their positions on the moving

the horses. Furthermore, he describes the effect as employing only two treadmills, whereas Paris Port de Mer employed three for the horses alone. Laumann, pp. 128-29. Louis Schneider, writing in 1903, also notes a race effect at the Variétés Théâtre which employed two treadmills installed in the two upstage rues, and it is possible that racing machines were used in more than one production at the Variétés. Louis Schneider, "Mise en Scène et Machinerie," L'Art du Théâtre (supplement), December 1902, p. XXXIV.

19 Although the stationary barrier, "placed in a fixed position on an immobile part of the plane of the theatre" [à poste fixe, sur une partie immobile du sol de théâtre], was undoubtedly necessary for safety, one wonders whether it might not better have been incorporated in the treadmill used by the spectators so that it would have passed by like the moving picket fence and the spectators could have used it for support. However, since the top rail of such a fence would have had to have been articulated in order to pass around the end drums of the treadmill belt, the mechanism required may well have been too complicated and hazardous to pursue. Laumann, pp. 128-29.
Laumann's brief account leaves many questions about the effect unanswered. He writes, for instance, about running horses, but makes no mention of individual treadmills being employed for each animal. Individual treadmills would have been an absolute necessity if unsecured animals ran in the effect. Furthermore, Laumann's account does not specify whether the treadmill carrying the spectators was upstage or downstage of the treadmill carrying the horses. Placement upstage would seem to have two advantages: firstly, actors upstage would not interfere with the audience's view of the horses and jockeys; secondly, the belt carrying the spectators would not have to move as quickly in order to provide the illusion of displaced scenery as it would if it was placed downstage of the horses, thus making it easier for the actors to sustain their balance on the moving belt. However, if the spectators were to be upstage, one wonders why figures painted on the panorama wouldn't have done as well. It seems most likely that multiple treadmills were employed, there being obvious advantages to having the horses run on individual treadmills, but the question of the


20 Interestingly enough, L'Illustration shows a group of spectators standing downstage of the running horses, watching the race (Fig. 32). These spectators, however, are not on a treadmill belt, but are standing in a group just onstage of the stage left proscenium wall. Since their stationary presence in an animated scene could not help but spoil the illusion, one wonders whether this is a product of illustrator's license, or whether the effect actually might have been staged this way. "Théâtre des Variétés," p. 236.
position of the spectators' treadmill, or whether such a treadmill was ever employed, is moot.

The division of the stage into easily accessible trapped areas must have facilitated installation of the racing machines in the Variétés's stage. Little cutting or extensive rebracing of the stage floor would have been necessary as long as the machinery was devised to fit within the areas of the rue or trappillons. Nevertheless, considerable reconstruction was necessary to enable the structure to resist the load imposed by the horses and treadmills. Georges Moynet wrote:

the installation required a total revision of the Variétés's substage machinery. M. Bruder [chief machinist at the Variétés] despaired to see his theatre at the mercy of electricians. These men, as they have done too often . . . slashed away, cutting recklessly in order to save time. M. Bruder had to intervene when one began to saw the sidepieces of the substage winding drum in order to free space for the play of transmissions.

The installation of these mechanical effects is not only costly to install, but also because of the subsequent repairs when one sets the theatre in order for ordinary plays. M. Bruder, hired to construct the same effect for a foreign theatre, managed to make it work solely by the use of human force. 21

One wonders at what foreign theatre M. Bruder accomplished this feat.

The horse-racing scene at the Variétés does not seem to have stimulated significant theatrical employment of racing

21 Moynet, pp. 335-36.
machines in France, nor, despite one journal's accurate prediction that, after the astonished first night audience began to clap, "the fate of Paris Port de Mer was assured for a hundred performances," did it engender an overwhelming desire for all Paris to view the effect. Nonetheless, it was regarded as a notable theatrical truc, and its description found a place in most contemporaneous texts on French stage effects.

The experiment with the racing machine in France produced a machine which was different in many ways from the machines of Neil Burgess which inspired development of the French effect, and was in some aspects less sophisticated. Although the French device may have been unique in its employment of motor-driven treadmills and unrestrained horses, the employment of slow-moving, manually powered winches to drive the panorama must have been somewhat detrimental to the appearance of the effect, although, in deference to the skill of the French theatre machinists, one must admit the possibility that had the panoramas been longer, or constructed as an endless belt, they would have employed machine power to drive the panorama as well as the

treadmill belts.

The decision to employ motor driven treadmills instead of elaborate, shiftable treadmill carriages to enable the race to be won or lost must have facilitated design and installation of the effect, but must have also introduced more hazard than that which attended Burgess's devices. With the Burgess machines, there was no danger that horse and rider might "dash themselves against the wall" should the treadmill operator become inattentive or confused. The French machine, however, had no visible stays and restraining rods to spoil the illusion.

The French device, as was appropriate to the varietal nature of a revue, was employed essentially as a spectacular novelty, and indeed, the employment of racing machines in many of Burgess's plays, and even to some degree in Ben-Hur, partook of this quality. In this latter play, and in The County Fair, however, the race scene was also an integral part of the plot, and essential to the resolution of the story. It remained, however, for the English to exploit the racing machinery as wonder arousing spectacle and as an element of exaggerated scenic realism in a series of Drury Lane autumn melodramas in which a horse race was essential to the plot, and in which each succeeding racing machine improved upon its precursor, just as each succeeding production was obliged to better the spectacle of that which came before.
CHAPTER VI

THE RACING MACHINES AT DRURY LANE

Other than Paris Port de Mer, the race scene from The County Fair did not inspire numerous attempts to stage similar live race scenes in France. The same, however, was not true in England. There, Neil Burgess's machines and the improvements introduced later by Claude Hagen in Ben-Hur inspired the staging of horse racing scenes in a series of Drury Lane autumn dramas of ever increasing scenic complexity.

Under the management of Arthur Collins, the Drury Lane autumn melodramas had become eagerly anticipated spectacles of extreme scenic embellishment. Three of these Drury Lane autumn melodramas were horse racing plays which employed treadmills and panoramas. These three, The Whip, The Hope, and Goodluck, followed a formula of lengthy pedigree in which the fortunes of the sympathetic characters hinged upon the successful running of their horse in a major race and the discomfiture of a villain who plotted to handicap the equine favorite.¹ The plays display progressively complex

¹ Theatre reviewers reaching for antecedents, of which 214
plots studded with increasingly numerous complications, and having an increasing number of elaborate sensation scenes.

The Whip, the Drury Lane autumn drama for the 1909-10 season, was the first of the native English dramas to employ horse racing machinery utilizing treadmill and panorama, and is typical in the contrivance and complexity of its plot: Lady Diana, ward and heir to her guardian's money but not his title, has fallen in love with an impoverished neighbor, there seemed to be no lack, frequently referred to such plays as In Old Kentucky, The Sporting Duchess, and The Prodigal Daughter. A. H. Saxon summarizes the characteristics of the genre in Enter Foot and Horse: "some good soul, faced with imminent disaster unless he or she could raise a considerable sum of money, staked the remainder of his fortune on a horse race, was nearly prevented from winning by the machinations of the villain, but was saved in the nick of time by the appearance of the hero or of one of his allies, who went on to ride the chosen horse to victory in a fifth act finale."

A Run of Luck, opening August 28, 1886, was the first of the heavily dressed and mounted racing dramas produced by Sir Augustus Harris at Drury Lane. In this play the race seemed to be observed from the vantage of the paddocks where a stage crowd cheered and waited the return of a foam covered winner while the horses made what speed they could running the short distance from wing to wing. Occasionally such scenes were staged with wire drawn miniature model horses, as Dion Boucicault did earlier in Flying Scud at the Holburn Theatre in 1866.

Raleigh and Hamilton wrote The Derby Winner, one of their first racing plays, with Augustus Harris in 1894. This was presented at Drury Lane, with live horses of course, in September 1894. As seemed to become a tradition, the race was the occasion of an opening night embarrassment in which the favored horse refused to run in view of the audience, making necessary a post-curtain apology by Harris who reassured the audience that despite the evidence of their eyes, the hero's horse was indeed the first to pass the pole. A. H. Saxon, Enter Foot and Horse (New Haven: Yale Univ. Press, 1968), pp. 223-4; "A Sporting Melodrama," Pall Mall Gazette, 30 August 1886, p. 5; and "Our Ladies' Pages," The Sketch, 26 September 1894, pp. 498 & 501.
Lord Branchester, whom she has met through the agency of an automobile wreck. Her suitor, Captain Sartoris, is heir to the title of her guardian, Lord Beverley, but must gain control of Lord Beverley's money to remain solvent. Abetted by a vulnerable curate and by Branchester's loss of the memory of events immediately preceding the automobile accident, Sartoris convinces all but Diana that Branchester has wed Sartoris's ally, Lady D'Aquila.

Act two introduces complications: Sartoris tricks Diana into signing a promisory note by means of an autograph trick and then uses the note to bet heavily on the upcoming race at Newmarket, a race in which Diana has encouraged Branchester to bet heavily on The Whip, the favorite of Beverley's stable. In fear that The Whip might win and force disclosure of his fraudulent note, Sartoris and D'Aquila plot the destruction of the horse by contriving a railway wreck. Their plot is conceived in Madame Tussaud's Wax Museum, where it is overheard by The Whip's trainer, whose sister had been betrayed by Sartoris. Locked in the Museum overnight, the trainer is unable to prevent The Whip from being shipped by rail to Newmarket, but is able to call his sister who speeds to the scene of the wreck by car and releases The Whip from his box just moments before the collision.

Sartoris, desperate, his fraudulent note having been detected by Kelly, a bookmaker and blackmailer, attempts to prevent The Whip from running by bringing charges against
Harry, The Whip's jockey, just before the start of the race. While Lady Diana attempts to ride in Harry's place, but is prevented by the Stewards, Branchester incites the racetrack crowd by appealing to their sense of fair play, and the crowd holds off the police, thus allowing the race to proceed, with Harry mounted, and The Whip to win.

Although a race scene was an important sensation scene in the last act of The Whip and the other Drury Lane racing plays, it was not necessarily the climactic scene, nor the most spectacular, having been eclipsed by preceding scenes of disaster in all three plays. The race scene in The Whip was only one of a series of notable spectacular scenes. Because Drury Lane audiences had become accustomed to expect detailed scenes of sensation, grandeur, and local color in their autumn dramas, The Whip sported vistas of formal gardens, scenes of the grand interiors of a great country house, elements of local color such as a comic scene set in Madame Tussaud's Wax Museum, and three sensation scenes: a staged auto wreck in act one, a staged train wreck in act three in which the villain engineers a collision between the horse box bearing The Whip and a following express (Fig. 34), and lastly a staged representation of the Newmarket race for the 2,000 guineas, a race second in popularity only to the Derby at Epsom Downs. These scenes, impressive even in the record of flat-lit photography, were distributed among the Drury Lane artists Henry Emden, R. McCleery, and Bruce Smith, the same artists who painted the Drury Lane
Fig. 34 Train wreck scene in The Whip

Fig. 34 Train wreck scene in *The Whip*
scenery for Ben-Hur. 2

The Whip opened at Drury Lane in the autumn of 1909. 3
Written by the veteran melodramatists Cecil Raleigh and
Henry Hamilton, a duo responsible for many successful Drury
Lane autumn dramas, The Whip proved to inordinately popular,
and was removed only because of the impending seasonal
pantomime. It was revived in March of 1910 for two hundred
and seventy-seven further performances, and was later
transported wholesale to the Manhattan Opera House, New
York, in the winter of 1912. 4

At Drury Lane the race scene in The Whip employed eight
horses running on individual treadmills. 5 Two of the eight

2 Henry Emden, who was responsible for the scenery of A
Run of Luck, the earliest of Augustus Harris's racing
dramas, was responsible for the picturesque exteriors in
acts one and two; Bruce Smith prepared the numerous scenes
of act three including the scene at Madame Tussaud's and the
scene of the railroad wreck at "Mansfield Junction." R.
McCleery did "The Great Hall" in act one and the scenery for
the race in act four. Drury Lane program for 6 March 1910,
The Theatre Museum, London. Note that in the synopsis of
scenes in the program the following scenes appear in bold
red type, an indication of their value as spectacle: "The
Kennels, Falconhurst;" "The Great Hall;" "Mansfield
Junction;" and "The 2,000 Guineas." The Play Pictorial, no.
87, vol. xiv, credits all three scenic artists with
preparation of the panorama for the race.

3 An extensive review of The Whip, which opened at
Drury Lane Thursday, 9 September 1909, may be found in
"Drury Lane," The Stage, 16 September 1909, p. 18.

4 Brian Dobbs, Three Centuries of the Theatre Royal:
Whip," Variety, 29 November 1912, pp. 73-74.

5 Most accounts of the race note that eight horses were
employed although some, whose interest does not lie in the
treadmills, those used by The Whip and its closest competitor, were drawn along troughs in the floor by means of manually powered winches rigged to allow gains and losses during the race and to pull The Whip ahead at the finish. As in The County Fair, the horses were securely harnessed to iron rods which retained them upon their treadmills. The winches used to shift the treadmills, each winch operated by one man, were installed in the substage, where the operators were cued by another man watching the race through a hole in the stage floor. Unlike the machines used in Paris Port de Mer, the treadmills in The Whip were not motor driven, but were moved through the volition of the running horses.\(^6\)

The treadmills were backed by a complex of five moving panoramas (Figs. 35 & 37), an advance of two beyond the mechanism employed by Hagen in Ben-Hur. The largest of the panoramas, an endless belt extending nearly the width of the stage, was erected upstage in the conventional position for a backdrop. The stage left drum of this panorama was coupled to a fifteen horsepower electric motor in the substage by means of a spindle which passed through the stage floor. The four remaining panoramas were portable endless belts that, during the race scene, were placed

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scale of the effect or the machinery employed, cite other figures. Dobbs records that sixteen horses were employed. Dobbs, p. 77.

Fig. 35 Staged photograph of the start of the race in The Whip

The eight horses are present, standing on matting covering the stage floor; the treadmills have not been uncovered and the horses are not secured in place. Note that the side panorama is visible at right in the photograph, but that its junction with the rear panorama is inconspicuous. One can discern the space between the bottom of the main panorama cloth and the stage floor upstage. This photograph is a reproduction of the Foulsham and Banfield photograph of the scene at Drury Lane. "Scenes in 'The Whip,' at the Manhattan," Theatre Magazine, November 1912, p. 135.
Act 3. Ready for the start in the great race

Fig. 35 Staged photograph of the start of the race in *The Whip*
diagonally in the wings, two at stage right and two at stage left. These were driven by individual electric motors within each panorama, although all five units were controlled from the same switchboard that controlled the stage lights.  

At Drury Lane endless grass colored belts, very similar to those employed by Hagen in *Ben-Hur*, worked between the running horses, serving to enhance the illusion of the track receding behind the horses' hooves, and to hide the junction of treadmill belt and stage surface from view of most of the audience. These belts were powered by a ten horsepower electric motor mounted beneath the stage at up left (Fig. 36). The motor was coupled by a drive belt to a long horizontal shaft which was aligned perpendicular to the proscenium beneath the stage at stage left; pairs of bevel gears were used to transmit the motion of this shaft to vertical spindles which drove the endless "grass" belts. To provide space for the machinery of the treadmill carriages and these endless grass belts, the stage surface was built up about twelve inches above its normal level, as had been done for *Ben-Hur*.  

A mobile winner's post, a device not employed in any of the previous racing plays, completed the effect. When used

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8 Ibid.
The machinery in this photograph (with the exception of the hand winch at lower right) was used to drive the main panorama and the endless grass colored belts of the race scene. The motor at left in the photograph, a ten horsepower unit, was coupled by a belt drive to the long horizontal spindle shown suspended beneath the stage at upper right of the photograph. Bevel gears and short vertical spindles coupled the movement of the main spindle to the grass colored belts on stage. The right-hand motor was a fifteen horse-power unit used to drive the main panorama. The vertical drive spindle from the stage left roller of the main panorama can just be seen behind the drive pulley of the horizontal shaft of the grass belt machinery, but the gearing and belting which coupled the drive motor to the vertical spindle are obscured in the photograph. "Drury Lane Stage: Its Machinery and Mechanical Equipment," The Stage Year Book (London: Carson and Comerford, 1910), p. 22 and photographic pages following.
Fig. 36 Substage Machinery for The Whip at Drury Lane
at the Manhattan Opera House in New York in 1913, the device was described as being a post mounted on rollers which, when The Whip crossed the finish line, was pushed to the rear by a man standing behind it and masked by a black background. One wonders why, however, the device was not moved by means of inconspicuous cables, perhaps by a stagehand concealed in the wings. Such a mechanism would have been very simple to rig, and would have obviated the obtrusive piece of black masking which, if actually used, could not help but spoil the effect. Indeed, indirect movement by means of cables could explain the mysterious instance on the occasion of the opening night of The Whip at Drury Lane in which the post moved off in the wrong direction, outdistancing the striving horses. Such a mistake would not have been likely if a stagehand moved the post directly, but is conceivable if he moved the post by means of wires and pulled the wrong line.

A cover illustration from The Scientific American


10 This was only one of several mishaps which marred the opening of this highly mechanized drama, the most notable of which was the failure of the panorama of the railroad wreck scene. The mishap in the horse race is variously described, in many cases involving only the retrograde movement of the winning post. Dobbs and MacQueen-Pope, however, have the judges' box prematurely rising to the flies, and Dobbs has The Whip finishing "a bad fifth." "Drury Lane," The Daily Telegraph, 10 September 1909, p. 11; Dobbs, p. 173; and W. J. MacQueen-Pope, Theatre Royal Drury Lane (London: W. H. Allen & Co., 1945), pp. 298-9.
illustrates the race effect employed in The Whip at the Manhattan Opera House (Fig. 37). The horses are shown running toward stage right, and the two trenches in which movable treadmills worked are clearly illustrated. The shiftable treadmill carriages, however, are shown as being worked only by a single draw line attached to hand winches beneath the stage at stage right. Thus they could not be used to achieve the effect of alternating gains and losses, except by alternately drawing one horse ahead of the other, both horses gradually progressing only toward stage right. Unlike the performance at Drury lane, no endless grass belts were employed for the ostensible reason that by setting the treadmills flush with the floor, the tiny movable ground-rows were not necessary for concealment of the junction of track and stage.

The Scientific American shows the large rear panorama being driven directly by a large, thirty-five horsepower electric motor placed beneath the stage at up right, bevel gears being used to transmit the motion of the horizontally mounted motor to the panorama's stage right drum. The individual motors for the small portable panoramas are shown

11 The Scientific American, 25 January 1913, cover ill.

12 Variety, however, noted that "for the benefit of those in the upper portion of the house, the treadmills might be hidden behind foliage to preserve the illusion." The mechanics of the effect must have improved with practice because at the Manhattan Opera House the first night went off "without a hitch, wait, or noise." "The Whip," Variety, p. 74.
Fig. 37   Cut-away view of The Whip race scene at the Manhattan Opera House

Note the stage hands below stage cranking the winches used to draw the two movable treadmills forward. Also note the motor and bevel-gear transmission used to drive the main panorama cloth (shown below stage at left in the photograph), and the cut-away of the side panorama showing the individual drive motor concealed inside. The winner's post and the black masking concealing the stage hand moving it are shown just behind the lead horse. The Scientific American, 25 January 1913, cover ill.
Fig. 37 Cut-away view of The Whip race scene at the Manhattan Opera House
mounted at the center of the units within the panorama cloths, and appear to drive the cloths by means of pulleys and a twisted belt. The movable winner's post is also shown, the figure of the operator traced in dotted lines on the visually intrusive black masking which hid him from view.

The race in *The Whip* was staged much like that in *The County Fair*. The scene preceding the race was a crowd scene using no built-up scenery, and therefore quick and easy to strike. As the crowd scene ended, the mob, which had been incited to prevent the police from arresting The Whip's jockey and thus disqualifying the horse, dispersed to left and right, the stage darkened, and a curtain descended. When the lights were again brought up, the race was seen in progress. Like *Paris Port de Mer*, the race was arranged to be the final scene in the show, the audience being left to infer a happy resolution from the fact of The Whip winning the race, thereby avoiding lengthening the evening with an additional scene and the need to reset the stage.  

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14 The licensing copy of the script in the Lord Chamberlain's Plays had nothing following the race, and the race itself is simply listed as "Tableaux of the Race. (No. Dialogue.) THE END," nor do London and New York programs list a scene following the race; however, MacQueen-Pope mentions a "last short scene" following the race, and a contemporary review suggests that such a scene did exist and was superfluous, noting "[the race] is an exciting and fine finish . . . and one feels that a return to the Birdcage again just to bring on all the characters for a final rally is unnecessary." This statement, however, may have been the
In New York, *The Whip* appeared at the Manhattan Opera House on 22 November 1912, as the first of a proposed series of Drury Lane Imports arranged between Arthur Collins, Wm. Bradey, Raymond Comstock, and Morris Gest.  The Whip was a decided success; its "creaky" plot generally was regarded as a fine descendant of the rousing melodramas of yesteryear, and its sumptuous scenery, essentially the same employed at Drury Lane, was, despite the occasional delays due to balky journalist's apology for the lack of a customary concluding scene. Typescript of *The Whip* in the Lord Chamberlain's Plays, The British Library, Manuscript no. 103, Lic. 13-9-1909; MacQueen-Pope, pp. 298-9; and "Drury Lane," *The Stage*, p. 18.

Set-up and strike of these intricate scenes was facilitated by carefully sequencing heavy and light scenes, and no doubt the resources of the highly mechanized Drury Lane stage were employed; the same would hold true at the Manhattan Opera House. Program notes claimed that the scene changes varied from one half to one and a half minutes in duration, the change to the race requiring only half a minute. Manhattan Opera House program for 24 February 1913 in NYPL-ROSE, MWE2 n.c. 86, pp. 37-8.


Some other columnists, however, did not appreciate the play's pedigree; the *New York Evening Post* noted that the play was indeed an antique melodrama, but that as "living drama . . . it [could] assert no claim to so much as a moment's consideration." Nonetheless, the spectacle scenes, the Post conceded, were "remarkable achievements." "Music and Drama," *New York Evening Post*, 23 November 1912, p. 12.
machinery, universally admired.\textsuperscript{17}

The vast Manhattan Opera House, the stage of which was slightly smaller in height and area than the Drury Lane, was, with minor structural adjustments, just capacious enough to house the London scenery, the original equipment of which was "freshened up" for the occasion.\textsuperscript{18} A Comstock and Gest publicity release boasted that the "entire freight capacity of two ocean liners was necessary to transport the equipment of [its] thirteen big scenes . . .," that the railroad collision alone required hidden devices weighing

\textsuperscript{17} Even Burns Mantle lauded the race claiming that it "outdid the most perfect of moving pictures, at the last." Burns Mantle, "In the Show Shops," \textit{New York Evening Mail}, 23 November 1912, p. 9. Also see: "The Whip," \textit{Variety}, 29 November 1912, p. 73; and \textit{New York World}, 23 November 1912, p. 5.

Unlike at Drury Lane, the opening of The Whip at the Manhattan was not an occasion disgraced by balky mechanical scenery; in fact, despite Mr. Gest having been run down by the stage train at the afternoon rehearsal, all performed flawlessly at the evening's opening. The wear of time, trouping, and lack of care eventually led to failures. When The Whip appeared for the second time in Brooklyn, the scenery showed signs of strain: "The scenery, which makes the play, with the 'wonderful' stage effects, including the train wreck and the Derby, seems to have lost confidence in itself, and was very nervous last night. The trees were tired, and wanted to sit down, and the train wreck had all the realism of a 'Punch and Judy' show. . . . with a little more practice the stage hands will improve their part of the production." "Whip Pleases, But Scenery Wobbles," \textit{Brooklyn Daily Eagle}, 25 November 1913, Picture and Sporting Section, p. 8.

thirteen tons, and that "hundreds of trips by the largest 40 foot scene trucks" were necessary to transport the production to the theatre.19 Because it was so massive, the production was declared impossible to troupe, and that the engagement was to be exclusively at the Manhattan Opera House;20 nonetheless, by the end of 1913 two companies of The Whip were on the road,21 usually appearing to SRO houses, and by 1915, in great degree indebted to theatre modifications pioneered by Ben-Hur, The Whip, now reduced to one company, was appearing in theatres in the American heartland.22

The Whip played the road to generally good business, a large measure of its success attributable to the sumptuous scenery and the elaborate wreck and race scenes. The race scene, however, although much improved over the spectacular scenes of The County Fair and Ben-Hur, was becoming somewhat passé and was unable to sustain the element of spectacle by itself. Its value as a scenic novelty had diminished, especially considering the ease with which such scenes might be accomplished realistically on film, and the expense and

20 Ibid.
difficulty of producing and trouping such scenes did not justify further interest by American producers. The Drury Lane, however, was firmly committed to scenic extravaganza, and its mechanics had the expertise necessary to expeditiously accomplish the race effect. Therefore it was at the Drury Lane that the staged horse race appeared twice more before the effect joined the no longer employed theatre technology of yesteryear.

The Hope, the second of the Drury Lane autumn dramas to utilize horse racing machines, opened 14 September 1911, in the season following the withdrawal of The Whip. Also written by the team of Raleigh and Hamilton, The Hope, like The Whip, was a scenic extravaganza which followed the customary formula and was replete with scenic vistas, exotic local color, and breathtaking sensation scenes.

23 "London Theatres," The Stage, 21 September 1911, p. 17. Although The Whip was produced in the 1909-10 season, it was revived following the pantomime, thus the 1910-11 season saw both racing dramas.

24 The Hope is sufficiently complicated to make even a summary lengthy: its hero, young Norchester, has become head of his all but bankrupt house and hopes to restore the family fortune by winning the Derby with a promising young colt called The Hope. Both Norchester and the villain, Captain Grant, have fallen in love with Brenda Carlyton, a penniless young woman of "good birth" who has been reduced to serving as a lady's companion to Olive Bendermeer, daughter of a moneylender who wishes to keep his occupation secret lest it impaire his daughter's chances in society. Olive is about to embark on a lengthy tour, and the lady Don of an Oxford college, who is secretly the wife of an acrobat aspiring to become a bookmaker(!), is engaged as a traveling companion to the young ladies.

The second act finds Norchester in India, where he has won the V. C. in a frontier war. Also present are Grant,
Whereas *The Whip* sported English garden estates, a hunt club breakfast in a great hall, and a scene in Madame Tussaud's Wax Museum, *The Hope* displayed striking likenesses of Indian scenes including "The Mall at Simla" and the "Interior of the Dewan Kas" (Fig. 1); in place of the sensational race and railroad wreck scenes in *The Whip*, *The Hope* employed a horse race with novel staging and, taking advantage of public interest engendered by a recent Italian earthquake, a spectacular earthquake and fire scene complete with burning Brenda, Olive, and their chaperon, along with the tipster husband of the lady Don, selling tickets for the Calcutta Sweep (One must admit a certain element of coincidence). Grant has seduced Olive and has refused to marry her, the daughter of a moneylender being beneath his station. Olive decides to run away, and by switching her incriminating letters, Captain Grant makes it appear that Norchester is the cause of her flight, thus precipitating a break between Norchester and Brenda.

On return to England, Norchester finds that the moneylender has determined to seek revenge for his daughter and has purchased Norchester's debts. Unable to pay, Norchester sees his property, including *The Hope*, seized by a bailiff.

In the meantime, the bookmaker has located Olive hiding in Italy, and Brenda and Norchester go to her to importune her to reveal her seducer. Olive, however, has received a letter from Grant promising to marry her if she will not betray him, and remains silent until an earthquake and seemingly inescapable death incite her to confess.

Norchester is buried in the quake, and reports of his death flying abroad prompt Grant to bet heavy sums of money against *The Hope*, which cannot race if its nominator is deceased. The moneylender, now disabused regarding his daughter's disgrace, cooperates with Norchester, who has escaped unharmed from the debris of the quake, in accepting Grant's wagers. The Hope, of course, does race and win, recouping Norchester's fortunes at Grant's expense and enabling Norchester and Brenda, and a repentant Grant and Olive, to wed. Typescript of *The Hope* in The Lord Chamberlain's Plays, The British Library, Manuscript no. 315, Lic. 18.9.11.
and collapsing buildings (Fig. 2). Evidently the formula employed for *The Whip* was considered good enough to use again, and indeed, so many were the similarities between the plays that it is said that the cast continually forgot themselves and used the name of the earlier play.

The race scene in *The Hope* employed only four horses, a fall from previous greatness no doubt accompanied by significantly fewer expenses. These horses ran on treadmills which, for novelty's sake, were set perpendicular to the line of the proscenium so that the horses appeared to run toward the audience rather than across the stage.

Panoramas seem to have been employed, and were probably

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25 As in the preceding Drury Lane racing play, the scenery was divided between artists McCleery, Emden, and Smith, Henry Emden rendering the spectacular earthquake scene and the scenes of India in act two, and Bruce Smith, who undertook the race scene in *The Whip*, being responsible for the Derby scenes in act five. Invitation program dated 14 September 1911 in the Drury Lane file, The Theatre Museum, London.


27 English reviewers were struck by the novelty of the effect, none of them recognizant of Neil Burgess's more lavish staging of a similar effect in *The Year One* some fifteen years earlier in the United States. Although the use of fewer horses was more economical than the larger number used earlier in *The Whip*, reorienting the treadmills perpendicular to the proscenium probably made it impossible to sink the treadmill apparatus in troughs created by dropping the stage bridges, thus necessitating building up the stage floor to surround the apparatus. "The Hope," *The Daily Telegraph*, 15 September 1911, p. 11.

symmetrically arranged on diagonals across the stage, splaying out and down from upstage center much like those shown in Towers's U. S. patent no. 666,714.  

Although reviews refer to the horses galloping "on and on" toward the audience, one cannot confidently infer that shiftable treadmills were employed to alter the positions of the horses as they were in the preceding Drury Lane plays using horse racing machines. Reviewers were no longer so impressed with the effect that they described the scene in detail, nor did the scene evince sufficient novelty to be reviewed in technical journals. Therefore there is some uncertainty about the staging of the effect and the particular machinery employed. The race, however, ran for some two minutes on the stage, and some further movement apart from the moving panoramas and flying hooves would seem to have been necessary both to indicate the winner and to prevent the scene from seeming static. It is possible, however, that the treadmills were fixed in position, and The Hope allowed to move forward on his treadmill by means of some simple mechanism such as a sliding restraint which permitted movement along the length of the treadmill. Thus the effect could be staged with the appearance of The Hope.
pulling ahead at the end of the race.

In order that the effect not be spoiled by harnessing the horses in view or showing their lack of synchronization at the start and stop of the run, staging the race with the horses running toward the audience required that the scene be set out of view of the audience and begun and ended with the horses still running. As in the earlier plays the preceeding scene, in this case the weighing room at Epsom Downs, was lightly set to allow a fast strike.\(^{30}\) While the weighing room scene played downstage, upstage the stage was set for the race, a heavy blackout curtain masking the light and muffling the noise of the horses being readied on the treadmills.\(^{31}\) This blackout curtain, which also served to end the race, was supposedly the cause of what surely must have been the most embarrassing mishap involving the staged

\(^{30}\) Such staging was common in plays using heavily built-up scenes or complicated effects which required much time to set up, and the technique of alternating light and heavy scenes, often setting the lighter scene downstage so that the setting of the heavy scene could proceed simultaneously upstage, was often provided for by the author. The licensing copy of The Hope has a note preceeding the complicated earthquake scene that "all must be kept very much downstage on account of a heavy strike and set behind. . ." The end of this play, however, is very imperfect in the licensing copy, and has no notes regarding the staging of the race. Since the race was the last scene in the play, however, the authors did not need concern themselves with preparing a scene used to cover the strike of the racing scene, which could be done at leisure.


\(^{31}\) W. J. MacQueen-Pope, Theatre Royal Drury Lane, p. 300.
races when, on opening night, the curtain cue was lost and the race run behind the blackout curtain, totally out of view of the audience which sat in the dark, tantalized by the noise from the darkened stage. The next night, however, saw the race work without a hitch. It was, as might be expected considering its precedents at Drury Lane, an effective scene, and the novelty of seeing the galloping horses head-on prompted one reviewer to exclaim:

There are four horses . . . galloping with flogging jockeys straight at you, as though they would take footlights and orchestra pit in their stride and finish in the pit. Go and see, and you will believe that the half could not be told you.

The stage race apparently still had some value as a drawing card.

In 1912, after The Hope, Ben-Hur was revived at Drury Lane, again treating the audience to the spectacle of a live staged race. Following the revival of Ben-Hur, however, there was not another horse race on the stage until Seymour Hick's and Ian Hay's Good Luck in 1923. This play, the last of Arthur Collins's management and the last Drury Lane "sporting play" utilizing racing machines, held the stage

32 W. J. MacQueen-Pope, The Footlights Flickered (London: Herbert Jenkins, 1959), pp. 105-6. Strangely enough, reviews do not mention this gaffe, perhaps because the unfortunate horses, having simulated a race of twelve furlongs, were whipped up to do it again, this time in view of the audience. Dobbs, p. 173.

33 "Drury Lane. 'The Hope,'" The Daily Telegraph, 15 September 1911, p. 11.
for 260 performances, from 27 September 1923 until 10 May
1924, despite having been received with reviews critical
of its confusing plot, perceived by some to have been
evidence of a "prentice hand."

Good Luck was another formula autumn melodrama, replete
with lavish scenery and sensation scenes. Among the
spectacular scenes in the play were a motor car crash, such
as occurred in The Hope, a prison fire and collapse, said to
have been a well handled but not exceptional scene, a
"wet" swimming pool scene involving a water tank, and, as
the ultimate sensation scene, a scene at sea on a stormy
night in which a yacht set out and foundered upon a rock
under the light of a marker beacon. The horse race, of
course, was in the last act, everything occurring before

34 MacQueen-Pope, Theatre Royal, p. 310.

35 "New Melodramas and Revues," The Graphic, 6 October
1923, p. 516. Other reviews were equally critical, The
Stage, for instance, chiding the authors for "putting
together . . . a complicated plot, overloaded with detail,
and making very large demands upon the store of credulity
possessed by the most lenient of Drury Lane audiences."
"London Theatres," The Stage, 4 October 1923, p. 16.

36 "Drury Lane Theatre," The Daily Telegraph, 28
September 1923, p. 10.

37 By this time there had been some change in the
stable of scenic artists employed by the Drury Lane: Bruce
Smith, however, was still responsible for the race scene,
and also undertook the spectacle scenes of the Parkhurst
Prison fire and the harbor and wreck at sea. The other
scenes were divided between the artists Humphries, Watson,
and E. H. Ryan. Souvenir program for Good Luck dated
September 1923 in the Drury Lane file of The Theatre Museum,
London.
having served as a complication to delay the hero's horse winning the race. This scene utilized the now familiar apparatus of the shiftable treadmills and revolving panorama, scenery that had become so familiar that many reviewers failed to mention its use. 38 As in the preceding "sporting plays," the scene before, in this case a scene set behind the grandstand at Ascot, was lightly set to permit a quick strike before the race scene. The race itself was run in the familiar format employed in The Whip and The County Fair, having the horses run parallel to the proscenium and backed by a moving panorama. 39 The entire act, according to the program, lasted only twenty minutes, and the staging was unusual only in that another scene followed the race, thus requiring a quick strike and change of scene at the race's end. The race scene introduced no innovations, 40 and was the last appearance of the racing apparatus on the Drury

38 "New Melodramas and Revues," p. 516. Other journals, while noting the race, cited similar scenes in previous plays, underscoring the perception that the effect was no longer novel: The Daily Telegraph described the effect as "exciting enough, done in the manner which we were accustomed in such pre-war dramas as 'The Whip' and 'The Hope,'" and The Stage remarked that the scene was "no better than in many previous sporting dramas," and "bore a family resemblance to the sensation that marked the staging of 'The County Fair'."  "Drury Lane Theatre," The Daily Telegraph, 28 September 1923, p. 10; and "London Theatres," The Stage, 4 October 1923, p. 16.

39 Souvenir program for Good Luck, September 1923.

40 Note that for some scenes the old technique of employing miniatures was contemplated, and indeed may have been used. The scene description for act one in the Lord Chamberlain's copy of the play script notes: "The back cloth
Lane stage and, perhaps, was altogether the last appearance of such apparatus on the legitimate stage. Cinema, having a ubiquitous and adaptable viewpoint and being able to economically reproduce complicated effects time after time without fail, had become the preferred medium for realistic sensation scenes, and the staged horse race, costly, encumbering the entire stage, and subject to mechanical failure, could no longer be depended upon to draw an audience on its own merit as a sensation scene, and therefore no longer found place on the legitimate stage.

represents the rolling downs on which a triel (sic.) is seen to take place during the act with miniature horses." Typescript of Good Luck in The Lord Chamberlain’s Plays, The British Library, Manuscript no. 5063, Lic. 4.10.23.
CONCLUSION

The illusion of the staged horse race depended upon a combination of treadmills and panoramas, machinery which developed from crude beginnings in the bucolic entertainment Josiah Allen's Wife to become the mechanism of one of the notable scenic spectacles of the Edwardian stage. Elaboration of the effect, however, culminated at a time when cinema, which had been recently introduced and which more easily accommodated the presentation of spectacular realistic scenes, was depleting the audience for the live stage. The race effect, complicated and costly to produce, served to draw an audience through sheer wonder that such an effect could be accomplished on the living stage, but this aspect of its attraction was not ultimately enduring, and the machine enhanced, staged horse race vanished from the legitimate theatre.

The horse race effect did not depend upon the invention of some unique device, but upon utilization and coordination of familiar machinery in a new combination. Its two principal features, the treadmill and the moving panorama, were already familiar devices, the moving panorama long having been part of the arsenal of theatrical effects,
and the treadmill having been a common item of agricultural machinery. The illusion of the staged horse race had its beginnings from a fusion of these two devices in the late 1800's. Neil Burgess, an American actor of eccentric female characters, perfected the racing machinery over a period of twenty-two years by gradual improvement and coordination of these parts, documenting his developments, along with numerous hypothetical applications of his devices, in a series of United States patents filed between April 1882 and June 1911. Burgess improved the machinery from a simple device used for the horse and buggy scene in Josiah Allen's Wife (1882) in which a tethered horse running on a treadmill "pulled" a buggy in front of a background formed by a moving panorama, to an elaborate race scene in The Year One (1895) involving two four-horse chariot teams which galloped directly toward the audience.

Claude L. Hagen further perfected the machinery of the race effect for the spectacular race scene in Ben-Hur (1899-1924), incorporating additional panoramas to further encompass the stage with a moving background and adding low, moving, ground rows to conceal the discontinuity of stage and treadmill surfaces. Employment of roller bearings in the panorama hangers and treadmill rollers, along with the use of improved electric motors to drive the panoramas and chariot wheels, enhanced the effect by affording an increase in speed and reliability.

The County Fair, an earlier racing play which was Neil
Burgess's major vehicle, was extensively toured throughout the United States, making the mechanism of the stage horse race familiar to numerous theatre mechanics and inspiring imitation. The vast popularity of Ben-Hur introduced the race effect to millions more spectators on several continents, and the mechanism of its race effect was popularized through publication in a variety of illustrated periodicals.

Both Ben-Hur and The County Fair appeared in England thereby stimulating the use of the race effect in European entertainments. The County Fair was instrumental in stimulating the appearance of the staged horse race in at least one Parisian revue at the turn of the century. This effect, in the form of a rather hazardous machine which seems to have employed untethered horses running upon motor driven treadmills, was developed by the theatre mechanic M. Bruder for the revue Paris Port de Mer at the Variétés Theatre in 1891. The effect then disappeared from the French stage until 1969, when it was resurrected for a spectacle at the Club Lido in Paris.

In England the effect had a longer tenure. After Ben-Hur had appeared at Drury Lane, the horse race effect was employed in no less than three Drury Lane autumn melodramas, extravaganzas noted for their spectacular scenery. The first of these scenes occurred in The Whip, in autumn of 1909, and employed eight horses in the race
running in front of a background of five moving panoramas. Although the scene attracted favorable notice, both at Drury Lane and later when it was presented at the Manhattan Theatre in New York, it was overshadowed by other sensation scenes in the play, notably a railroad wreck scene in act three. The race scene in The Hope, the second of the Drury Lane autumn melodramas employing a machine enhanced horse race, was novel to many in its audience in that the race was staged with four horses driving toward the orchestra rather than across the stage, but in this play, as in The Whip, the race was overshadowed by another sensation scene: an earthquake and fire in an Italian town. In Good Luck, the last of the Drury Lane autumn melodramas to employ horse racing machines, the race was overshadowed by two other sensation scenes: a prison fire and collapse, and the wreck of a yacht at sea, both occurring in act three.

The race effect in Good Luck appeared in 1923, long after it had become unprofitable to present such a scene elsewhere. By this time cinema had become the acknowledged medium for spectacular realistic effects, presenting them with an economy unmatched in the theatre. The value of the staged horse race effect lay in the attraction of seeing so difficult an effect produced on the living stage; even so, in its last appearance on the Drury Lane stage in Good Luck the spectacular horse race had lost much of its value as sensation, being only one of three sensational effect scenes, and of these probably the least significant.
Thereafter the horse race effect was not seen on the legitimate stage, and has become one of the vanished effects of turn-of-the-century theatre.
Appendix A

Plays copyrighted by Neil Burgess

Mother-in-law .................................. 15 Sept. 1877
Vim ........................................... 8 Aug. 1878
Widow & elder ................................ 5 Jan. 1880
Josiah Allen; Josiah Allen's wife & Betsy Bobbitt ................... 1 July 1881
Samantha & Betsy Bobbitt; Samantha Allen & Betsy Bobbitt .... 16 Aug. 1882
My Opinions .................................. 21 Sept. 1882
Ten to one .................................. 18 June 1888
County Fair .................................. 3 Feb. 1890
County Fair Circus ................................ 1 Mar. 1892
A. D. 1 ........................................ 12 Jul. 1892
Black cat ..................................... 3 Oct. 1896
County Line .................................. 3 Oct. 1896
Cyclone ........................................ 3 Oct. 1896
Odd Miss Podd ................................ 3 Oct. 1896
Spinster by preference; Spinster Thurber .................. 27 Dec. 1900

Appendix B

An annotated list of
U. S. patents held by Neil Burgess

256,007 4 Apr. 1882 Treadmill and panorama device for a buggy-ride scene: a buggy secured by concealed stays rides downstage of a moving panorama upon a horse driven treadmill; treadmill can be concealed with a ground row.

277,137 8 May 1883 Panorama and treadmill device similar to 256,007, but incorporating rotating side masking pieces and a downstage moving apron in the form of an endless belt; the moving scenery is illustrated coupled together as if actuated by the treadmill itself. Text describes the use of a blower to create moving air.

286,709 16 Oct. 1883 Racing device utilizing treadmills with horses tethered to offstage winches. Plan shows treadmills equipped with brakes and arranged downstage of a scroll-type panorama.

346,924 18 Oct. 1885 Balloon and projection screen advertising device.

418,372 31 Dec. 1889 Racing device employing treadmills mounted on hand-winched carriages which utilize flexible aprons at front and rear to conceal carriage slot in the stage; winches are concealed beneath stage. Double endless panoramas are employed, the taller working within the periphery

250
of the lower.

423,171 11 Mar. 1890 Racing machine similar to that illustrated in *The Electrical World*, 12 April 1890. A compound device consisting of treadmills mounted on carriages in front of an endless belt panorama with an endless belt picket fence operating downstage.

442,796 16 Dec. 1890 A carriage mounted treadmill apparatus arranged so that forward movement of the carriage is created by a winding drum driven by rotation of the treadmill itself. A pawl is used to prevent recoil of the carriage, and the use of spring motors is suggested to lessen the labor of the running animals.

442,797 16 Dec. 1890 A racing machine similar to that of patent 442,796, but employing a switch activated electrical annunciator actuated by cams mounted upon the treadmill to indicate the relative distance traveled.

455,288 30 June 1891 A bicycle racing machine consisting of bicycles mounted on treadmill carriages which are hand-winched across stage in a depression constructed downstage of a moving panorama; penny-farthings are illustrated, the treadmill surface driving the rear wheels. The treadmill carriages can be moved from beneath the stage by a dependent arm.

471,126 22 Mar. 1892 A racing machine composed of multiple, concentric, horizontally revolving discs and a hand winch device for controlling the position of tethered runners upon the discs; the axle-shaft of the discs is born on a movable carriage beneath the stage in case lateral movement of the discs is required. C.f. Chapman patent 423,372.

471,127 22 Mar. 1892 A hand-winched carriage racing
device used with a moving panorama backing; carriages bear multiple rollers as a running surface, and the stage is grooved to enable carriages to be moved from beneath by a dependent arm.

522,505  3 Mar. 1894  An illuminated advertising crawl suspended from a balloon.

542,792  3 Mar. 1894  A roll lantern slide apparatus to be used with a balloon.

542,793  14 June 1894  Advertising device in the form of a rear-illuminated scroll panorama.

736,360  18 Aug. 1903  A horse exercising apparatus: an inclined plane treadmill with adjustable height and belt tension.

784,919  14 Mar. 1905  A visible and audible applause machine composed of multiple, chain or gear driven arms which wave pieces of cloth and make clapping sounds.

924,632  15 June 1909  A device for simulating a bareback riding act by means of motor driven treadmills equipped with detachable stationary supports for the horses, and catwalks above the treadmill for unseen helpers to balance the counter-weighted equestrian performers. The device is illustrated with the applause device from patent 784,919.

996,452  27 June 1911  A device for simulating a bareback riding act composed of a treadmill and concealed stationary stay for the horse; the stay bears a concealed platform for the equestrians.
Appendix C

Patented Burgess Devices
Affiliated to the Racing Machines

Treadmill devices formed the greater part of Burgess's inventions, and he was most enterprising to secure the rights for their employment in any kind of show or display. Many of these devices do not seem to have been employed in any of the racing plays, but were patented for their potential theatrical employment. In several cases they involve mechanisms that potentially could be employed in the racing machines, or they display refinements that resulted in greater reliability or sophistication of the stage machines. Several inventions, although having a certain pertinence to showmanship, are described here only as interesting curiosities.

Patent 442,796, granted to Burgess 16 Dec. 1890, describes a treadmill device that might be used to stage a racing contest. This device was so arranged that an animal's rate of movement upon a treadmill belt controlled the rate of lateral movement of a carriage in which the treadmill was mounted. One of the treadmill end drums was mechanically coupled to a winding drum which reeled up a
rope which was secured offstage at the opposite end. As the rope was wound in, the treadmill carriage drew itself toward the point of anchorage. Varying the length of the rope and the diameter of the winding drum would vary the duration of the race and the potential speed of the treadmill carriage.

A more elegant solution would have been to self power the carriage by having the treadmill more directly actuate the carriage wheels, perhaps through a gear or belt transmission. Obvious—and potentially superior—alternative methods must have also occurred to Burgess, and he attempted to encompass them in his patent by including the caveat that "other means than the simple drum and rope may be employed to produce the desired result without departing from the main feature of my invention, and I do not limit myself to the specific means herein described for accomplishing this result."

An interesting accessory of this patent (and of no. 442,797 following) was the inclusion of a rack built into the carriage path in which a pawl attached to the carriage engaged the rack to prevent accidental recoil of the carriage when the animals began to run. Such a device was especially necessary on a mechanism such as this where an endless line did not provide tension in both directions on the treadmill carriage.

Another suggested accessory reflects Burgess’s discovery that the running horses labored visually when their own power was employed to operate all or part of the
machines. In this case the horse's power was not employed to operate associated panoramas, but only to move its own carriage. Nonetheless, Burgess notes that "a spring-motor may be connected to the supporting wheels . . . and thus take from the horse or like animal . . . the labor of propelling the whole weight of the carriage." Presumably in the case of a race or other contest each spring motor would be wound to the same degree so that no contestant would benefit more than another.

A better arrangement would have been to employ a separate power source capable of entirely driving the carriage without taxing the horse, and to have the horse's rate of movement control the application of the treadmill carriage drive through some sort of an escapement. None of Burgess's American patents show such a device, but his English patent no. 20,976, filed just a month after U. S. patent 442,796, shows just such a mechanism.

British patent 20,976 incorporates the mechanisms of both U. S. patents 442,796 and 442,797, as well as an escapement regulating device. In this machine a dial and pointer indicator is used to display to an audience the theoretical distance that the horse has run. The pointer is moved by a battery powered solenoid which drives a pawl and toothed gear movement. A spring loaded ratchet prevents the pointer from slipping backwards. The solenoid is triggered off and on by a set of spring loaded switch contacts on the treadmill carriage, which are momentarily closed once each
revolution of the treadmill by means of a lug attached to the treadmill belt. Thus each revolution of the treadmill is marked by a one increment movement of the pointer upon the dial.

This patent provides for the use of an exterior treadmill carriage drive controlled by the rate of the horse's movement upon the belt. In the patent illustration this is accomplished by a falling weight drive with rope tension control. Burgess's notes, however, make clear that this is only one of several possible arrangements that he contemplated. The illustration shows a falling weight tending to pull the treadmill carriage forward, the forward movement being arrested by a rope secured offstage behind the treadmill carriage and wound about a drum at the carriage rear. This tension drum is released in small increments by an anchor escapement, which is actuated by a series of lugs attached to the treadmill belt. Thus each revolution of the treadmill belt is accompanied by a measured forward progress of the treadmill carriage without requiring significant additional effort from the horse upon the treadmill. The patent notes indicate that Burgess contemplated substitution of electric motors for the falling weights, a substitution which would permit set-up of the apparatus with substantially less alteration of the stage on which the performance was to take place than a falling weight would require.
Among the more curious theatrical devices for which Burgess filed patents was a machine for creating visible and audible applause, U. S. patent 784,919, granted 14 March 1905. This machine was a stage device which simulated the applause and waving scarves and handkerchiefs of a crowd in a distant grandstand, and could have been used, if occasion required, as the background for a staged horserace or other similar event.

The device consists of a framework bearing vertical rows of articulated arms, each having a colored piece of cloth attached at the distal end. The arms were to be operated by a hand crank which turned an interlocked train of gears or drove a series of gears by means of a chain transmission. The arms were pivoted between the gear end and cloth bearing end, and were operated as trip levers by means of a pin or striker attached to the gears. As the gears turned, the arms would be lifted and dropped, and thus wave their handkerchiefs.

Furthermore, the arms were to be weighted at the handkerchief end so that they would fall against the surface they were mounted upon, thus creating the sound of applause. At the striking point they were to be fitted variously with leather or other resilient striking surfaces, with hard surfaces, or with no special surfaces at all. The combination of striking sounds could be varied by changing the mixture of striking surfaces, the various trip gear angles (thus varying the sequence and timing of the moving
arms), and the rate at which the gear train was driven.

This applause device was designed to be assembled on a large framework that could be flown vertically, and breasted into playing position when required. However, the weight and complexity of this machine would have mitigated against its use, and there is no evidence that this unique contraption was ever employed.

Burgess patented several stage racing machines similar to the device used in The County Fair, but which were not designed for horses. One, U. S. patent 455,288, granted June 1891, was a device for simulating a bicycle race upon the stage. This machine consisted of several wheeled treadmill carriages set upon tracks placed on the stage floor, or set into a depression let into the stage surface. The carriages were rigged so that they could be winched across the stage in front of a moving panorama. The patent provides that, if the carriages were sufficiently light, they could be pulled across the stage by means of an arm projecting into the substage through a slot cut into the stage floor. The bicycles were supported upon the treadmills by rigid braces, and the treadmill surface imparted motion to the non-driven wheel of the bicycle.

A similar device, with improvements, was patented by Frederick Wohlgemuth, 17 May 1892. This device, U. S. patent 475,226, employed a wheeled carriage arrangement similar to Burgess's bicycle device, but dispensed with the treadmills. In Wohlgemuth's patent modified "safety"
bicycles were used, both wheels of which were equipped with sprockets and driven by a gear chain. The bicycles were rigidly set upon braces attached to the carriage frame, and the bicycle wheels ran upon individual rollers set into the frame. These rollers were equipped with small fingers which, when the rollers were turned by the bicycle wheels, engaged flaps which tossed dust into the air beside the wheels, simulating movement of the bicycles along a dusty road. The dust was slowly dispensed onto the flaps from trays mounted in the carriage frame in front and behind the bicycle. The carriages were rigged to be winched on tracks placed on the surface of the stage and were concealed by a masking ground row, triangular in section, placed downstage of the tracks.
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