No. 871,917. PATENTED NOV. 26, 1907.

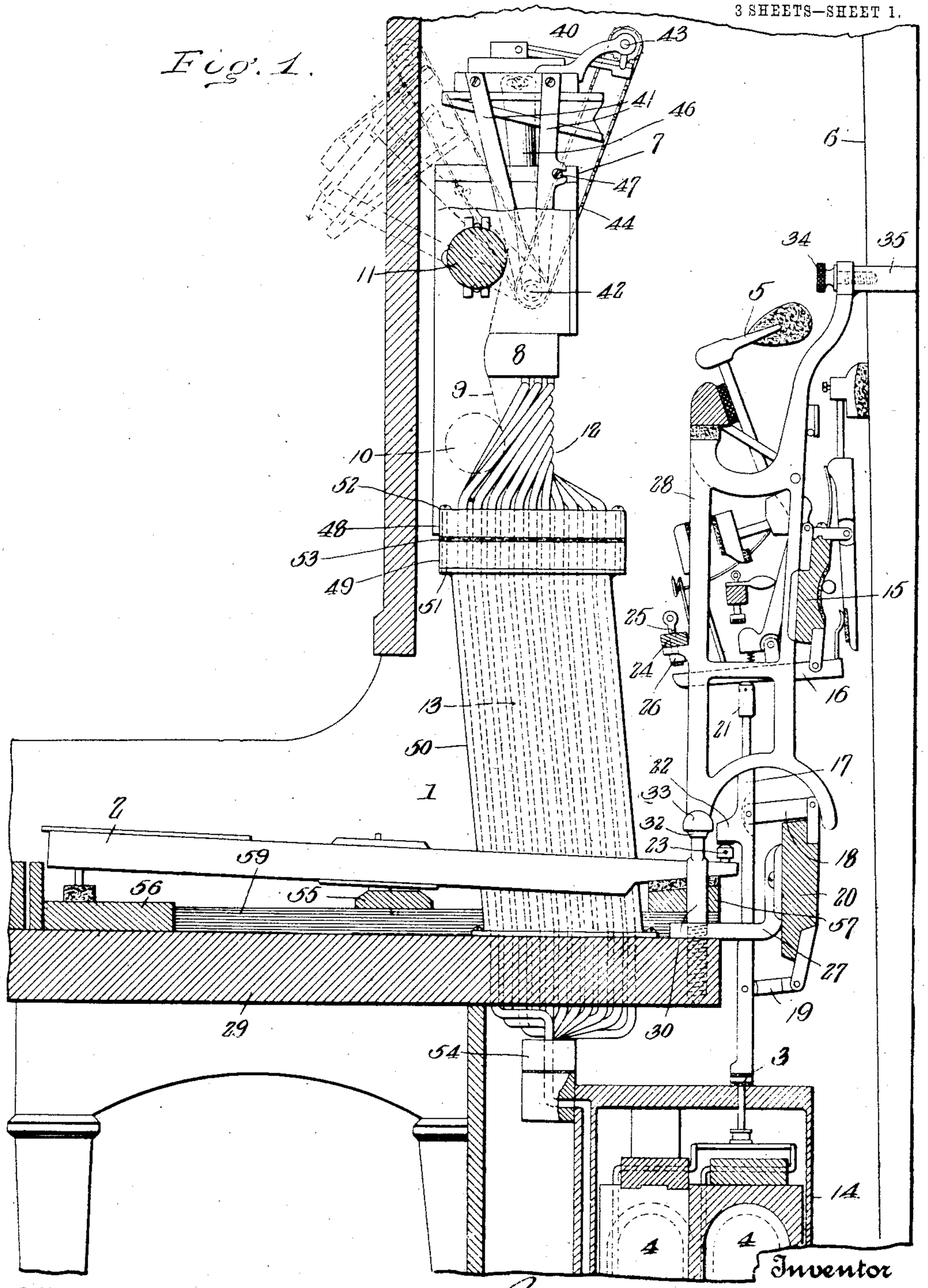
J. W. DARLEY, JR.

COMBINED MANUALLY AND MECHANICALLY OPERATED PIANO.

APPLICATION FILED NOV. 17, 1905.

3 SHEETS—SHEET 1.

Fig. 1.



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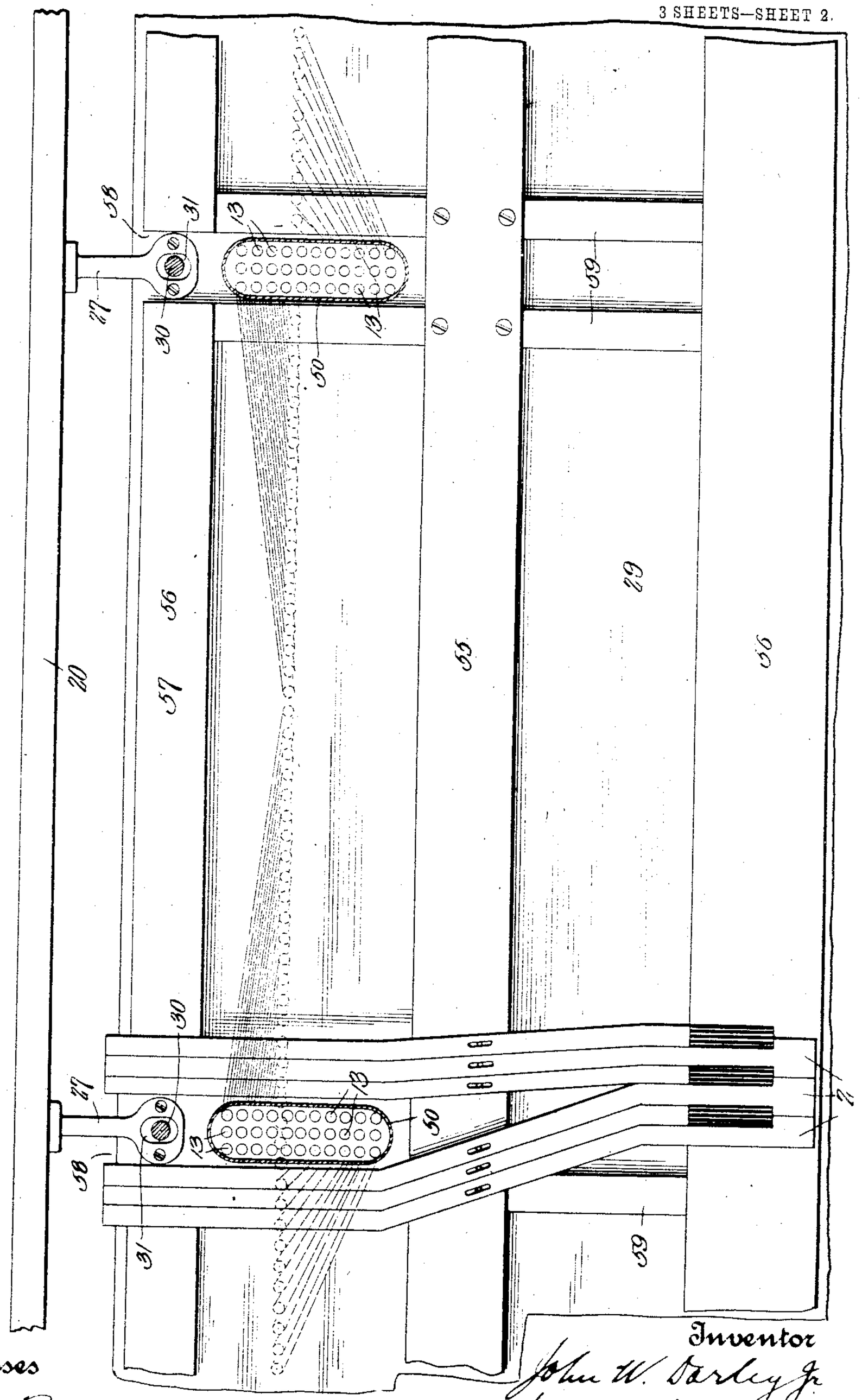
3 SHEETS—SHEET 2.

FIG. 2.



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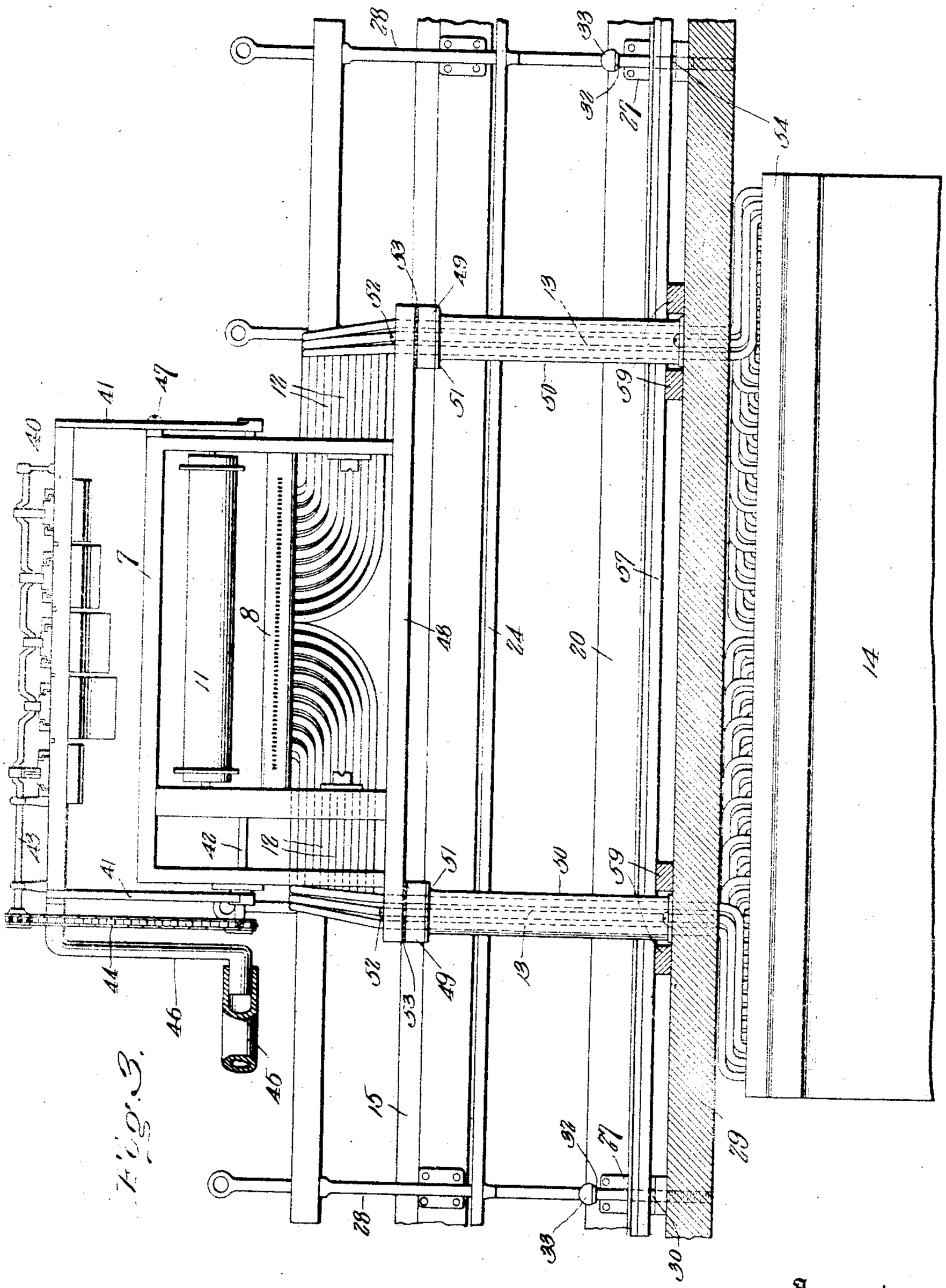
3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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COMBINED MANUALLY AND MECHANICALLY OPERATED PIANO.

No. 871,917. Specification of Letters Patent. Patented Nov. 26, 1907.

Application filed November 17, 1905. Serial No. 287,826.

To all whom it may concern:

Be it known that I, JOHN W. DARLEY, Jr., a citizen of the United States, residing at Baltimore city, State of Maryland, have invented certain new and useful Improvements in Combined Manually and Mechanically Operated Pianos; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to that class of musical instruments in which a piano-action and autopneumatic player are combined in one organization, whereby the instrument can be played either manually by fingering the keys or mechanically by operation of the pneumatics upon the parts which control the hammers of the piano-action.

The invention achieves the following objects: (1) improvement in the general construction and mechanical organization of the instrument; (2) simplification and increased efficiency of construction and operation of the organized mechanism for operating the piano-action from the keys without affecting the pneumatic strikers or impairing the quality of touch, or from the pneumatics without causing movement of the keys; (3) increased facilities for adjustment, simplifying the matter of regulating the piano-action as in ordinary instruments; (4) improved structure and arrangement of the several mechanisms composing the piano organization in such manner as to facilitate the initial construction, assemblage and adjustment of the instrument, and permit removal of parts or groups of instrumentalities without dismantling the entire instrument or deranging the respective mechanisms or groups of instrumentalities; (5) improved arrangement of the tracker-bar pipes in such manner as to leave the piano-action exposed at the front and conveniently accessible for adjustment and repairs, and disassociating these pipes from the keys or key-levers with resultant freedom of action and exemption from accidental contact; (6) compact arrangement of the pneumatic motor for driving the music-sheet mechanism and improved means for mounting the same in such manner as to allow displacement of the motor for access to the strings without disturbing the mechanism of the motor or its operative relation to the music-sheet mechanism; together with improvements in various mechanical details as hereinafter explained.

One preferred form or embodiment of my invention is represented in the accompanying drawings, which form a part of this specification. Without essential limitation thereto, the invention will hereafter be fully described with reference to said drawings, and then more particularly pointed out and defined in the appended claims.

In said drawings, Figure 1 is a vertical cross-section through the instrument, showing parts in elevation. Fig. 2 is a sectional top plan view above the keyboard. Fig. 3 is a front view of the interior construction of the instrument, showing the music-roll frame, tracker-bar, pneumatic tubes or tracker-bar pipes, and action-rails and supporting brackets therefor, but not showing the piano-action.

A particular explanation of the illustrated construction is as follows: The pianoforte-action is arranged as usual in the case 1 and is adapted to be actuated by the keys 2 or by the strikers 3 of the pneumatics 4 to cause the hammers 5 to impinge upon and recoil from the strings 6. In the upper front part of the case is the automatic pneumatic-controlling or note-selective instrumentality or music-sheet mechanism, mounted in the frame 7 and having the well-known characteristics of the tracker-bar 8 and perforated web or music-sheet 9 adapted to traverse the same for controlling admission of air to the ducts of the tracker-bar; the music-sheet being rolled upon the removable music-spool 10 and adapted in operation to wind onto the take-up roll 11. From the tracker-bar 8 the pneumatic tubes or tracker-bar pipes 12 and 13, extend down to the wind-chest or chamber 14, containing the primary or controlling pneumatics (not shown) and the secondary or operating pneumatics 4, which latter, when the instrument is played mechanically, are actuated by the controlling pneumatics from the impulses of air admitted by the passage of the music-sheet over the tracker-bar. It is understood of course that the wind-chest or vacuum-chamber 14 is in communication with any suitable wind-inducing apparatus, such as the usual bellows operated by the

performer's feet, which also furnishes power to the motor for running the music-sheet; all of which is so well known that specific representation and further explanation thereof are deemed unnecessary.

In view of the joint facilities for manual and mechanical playing, the piano-action (one complete element of which is shown in Fig. 1) is as a whole composed of two correlated mechanisms, an upper and a lower one, respectively supported by the upper and lower action-rails 15 and 20.

The upper mechanism is the conventional piano-action proper, including the group of operative parts actuated by the key (or by the pneumatic striker) for producing the stroke upon the string and effecting recoil of the hammer. It comprises the hammer 5 and regular associated devices, supported by the action-rail 15, and actuated as usual by its wippen, rocker or under-lever 16, which is pivotally-attached to the lower side of the action-rail and receives its movements (transmitted from the key or pneumatic striker) through the medium of its actuating-rod 17.

The lower mechanism of the action comprises principally the said actuating-rod 17 of the wippen, corresponding to the abstract in ordinary upright pianos. Said actuating-rod 17 is vertically-disposed close behind the rear end of the key or key-lever 2, and is pivotally-connected to and supported by guide-links or levers 18 and 19, which are themselves pivotally-attached to and supported by the lower action-rail 20; the positions and lineal portions of said links 18 and 19 being designed to maintain an approximately vertical up and down motion of said abstract or wippen-actuating rod 17 while conforming or adapting it to the movements of those parts (the key-lever, pneumatic striker and wippen) which affect or are affected by it. Said actuating-rod 17, whose upper end carries an adjustable cap or head 21 bearing against the under side of the wippen, is adapted to be supported both by the key-lever and the pneumatic striker, and thereby lifted or actuated by either of these agencies. Accordingly, it has a front projection 22 supported by an adjustable capstan-screw 23 upstanding at the rear end of the key-lever, while the foot of said rod 17 rests upon or above the striker 3.

Thus the piano-action may be actuated either manually from the keys, or mechanically from the pneumatics when brought into play by the wind-inducing apparatus controlled by travel of the music-sheet over the tracker-bar. These two actuating instrumentalities are entirely independent of each other, it being observed that the actuating-rod 17 of the wippen is supported both by the rear end of the key-lever and by the striker, but without positive connection with either, and also without positive connection with the wippen. When the keyboard or manual is fingered, the operation of the instrument is practically the same as in regular pianos, the wippen-actuating rod 17 performing the function of the common abstract; there being no positive connection between the key-lever and the pneumatic striker nor other dragging or heavy devices connected with the wippen-actuating rod to impede the free response to the key, so that the same ease and quality of touch and brilliancy of effect may be attained as in standard manually-operated pianos. On the other hand, by reason of absence of positive connection between the key-lever and wippen-actuating rod, or between the key-lever and the striker, the operation of the piano-action by the pneumatic strikers is effected without movement or bobbing up and down of the keys, as occurs in many combined manually and mechanically played instruments to the distraction of the performer.

The upper adjustable head 21 of the abstract or actuating-rod of the wippen allows regulation of the operative length of the actuating-rod between the wippen and the pneumatic striker, while the capstan-screw 23 allows regulation of the operative length between the key and the wippen, it being observed that independent adjusting means are thus provided, by the proper manipulation of both of which the accurate dispositions of parts necessary for perfect action is readily attainable.

A further feature of advantage in the mechanism described is that the entire connection between the piano-action or its actuating-rod and the pneumatic playing apparatus is situated at the rear end of the key, while all the parts are of simple construction and easily capable of adjustment.

For simplifying the matter of regulating the action, further adjusting means are provided as follows: Attached to the action brackets 28 is a longitudinal rail 24. A series of regulating screws 25 (one for each key or element of the action) is tapped through said rail; just above the front or free ends of the wippens 16, and the lower ends of said screws, which are shown provided with cushioned caps or feet 26, constitute abutments limiting the upward motions or swing of the respective wippens. The upper ends of these regulating screws 25 are shown formed with eyes to receive an adjusting rod or tool. In order to insure correct movements in the action, and proper working of the hammer, its jack, back-check, damper and other associated parts, it is essential that the wippen 16 and its abstract or actuating-rod 17 shall move or rise a certain distance at each operation, whether actuated by the key or by the pneumatic. This desired precision of movement is sometimes impaired by imperfect movements of the pneumatics or their

strikers, usually necessitating difficult adjustments, which however are avoided by means of the regulating screws 25. With these regulating screws, the abstract or actuating-rod 17 is accurately adjusted with respect to the key-lever, so as to be lifted the exact distance required, and the regulating-screw is then set to limit and prevent any increased movement of the wippen. The pneumatic striker is so adjusted as to have a slightly greater play than necessary, as from one-sixteenth to one-eighth of an inch, thus insuring the lifting of the actuating-rod 17 the required distance, while the regulating screw 25 prevents it from moving any greater distance.

The lower action-rail 20 is shown supported by the action-brackets 27, and the upper action-rail 15 by the upper action-brackets 28. Said lower brackets 27 are secured upon the bed 29 of the keyboard. The upper action-brackets 28 are supported by bolsters or posts 30 screwed into and projecting up from the bed 29 of the keyboard. Said bolsters or posts pass through longitudinal slots 31 in the feet of the lower brackets, to permit free adjustment of the latter transversely of the keyboard and action-rails, it being understood that such provision for adjustment is practically essential in view of slight possible inaccuracies in the castings of the metal brackets. The bolsters or posts 30 are surmounted by balls 32 which engage in cups or sockets 33 at the lower parts of the brackets 28, thus providing adjustable bearings therefor, the vertical adjustments being obtained by screwing the bolsters up and down in the wood bottom below the keyboard, the lower portions of the bolsters being threaded for that purpose. The upper brackets are attached at their upper parts to the back frame of the instrument by means of the usual headed screws 34 entered through the upper ends of said brackets and into projecting studs or posts 35. Proper disposition of the lower action-rail is thus afforded by securing the lower brackets in proper position, while proper disposition of the upper action-rail is afforded by adjusting the bolsters 30 and the screws 34 at the rear upper parts of the upper brackets. In constructing the piano, the lower rail with its mechanism is first mounted in the instrument, its brackets being fastened on the bed of the keyboard in such position as to locate the rods 17 of the wippens in correct position relative to the keys; and the upper rail with its mechanism is then mounted in place, its upper brackets being placed upon the bolsters 30 and the screws 34 and bolsters 30 being properly adjusted, to bring the upper mechanism or upper division of the action into proper relation with the keys and correlated mechanism of the lower division.

The music-roll supporting frame 7 in the upper front of the case, holds the tracker-bar 8, the take-up roll 11, and the bearing for the spindles of the removable music-spool 10. Mounted above said frame is the pneumatic motor 40 for operating the music-rolls. Said motor 40 is supported by a cradle 41 whose arms are pivotally-attached at opposite sides of the frame 7 co-axially with the shaft 42 to which rotation is transmitted from the motor-shaft 43 by the sprocket-chain 44; said shaft 42 being operatively connected with the music-rolls 10 and 11 by the usual mechanisms (not shown) for causing the take-up roll 11 to wind the music-sheet as it travels over the tracker-bar, and the music-spool 10 to rewind the sheet after the tune is played, as well understood. Air for operating the motor is supplied from the bellows or wind-inducing apparatus through the flexible pipe 45 to the crank-shaped pipe 46 which rocks with the cradle and has its lower arm in line axially with the axis of the cradle and coupled to the flexible pipe 45. By means of the binding screw 47 engaging a notch therefor in one side of the cradle the motor is held in its normal position above the music frame 7. This location and arrangement is obviously simple and compact and the motor is located in a more concealed position instead of at the side of the music frame where it usually obstructs the upper part of the sounding-board and strings. When it is desired to have access to the strings or sounding-board for adjustment, the binding-screw 47 can be loosened and the motor can be swung forwardly to the dotted line position indicated in Fig. 1, the front panel of the piano case having been removed for this purpose.

An important feature of this invention is the arrangement of the air pipes which connect the tracker-bar with the pneumatic playing apparatus below the piano-action. These pipes and tubes are grouped and disposed in such manner as to expose practically the entire front of the piano-action, providing ample access for adjustment, repairs, &c., and disassociating the pipes from the keys, without however incurring the objection of extending the pipes to the sides of the instrument before carrying them down to the pneumatics, with the consequent increase of materials and complications of such an arrangement. The pipes and associated mechanisms are further arranged in separate and detachably-connected groups or divisions, permitting the ready removal of parts without necessitating dismantling the instrument, interfering with other mechanisms, or derangement of the particular mechanism taken out. The means by which these effects are attained will now be described.

The music-frame 7 holding the tracker-bar 8 is supported upon a block or board 48

whose opposite ends rest upon smaller oblong blocks 49 arranged transversely. Said blocks 49 rest upon the upper ends of hollow or tubular standards or uprights 50, mounted on the bed 29 of the keyboard in the widened spaces occurring between the key-levers for accommodation of the intermediate action-brackets 27. Said hollow standards 50, which are narrow and oblong in cross-section, constitute casings or housings for the pneumatic tubes or tracker-bar pipes.

The whole series of tracker-bar pipes are divided into right-hand and left-hand groups or divisions, and further they are composed of upper and lower sections, or primary and secondary lengths, the secondary lengths 13 being continuations of the primary lengths 12. The primary lengths 12 of the pipes, extending from the tracker-bar and communicating with the respective ducts therein, are arranged or divided into two laterally diverging branches, which are carried in banks behind and to the opposite sides of the frame 7, and they are then turned or deflected downward to the ends of the block 48 and distributed fan-fashion along the widths thereof; the lower ends of said primary pipe lengths 12 being cemented or otherwise affixed in ducts or openings in said block. Said ducts in the ends of the block 48 register with those in the subjacent blocks 49. The latter register with the upper ends of the lower groups of tubes or secondary pipe lengths 13, which are arranged in narrow compact clusters in the casings or hollow standards 50. The upper ends of said secondary pipe lengths 13 are preferably secured in top-plates 51 of the standards 50, though if desired they may be affixed in the interposed blocks 49. Blocks 48 and blocks 49 are bolted or clamped by the bolts 52 upon the flanged top-plates 51 of the hollow standards, flat packings 53 being interposed between the blocks The secondary pipe lengths 13 pass through the casings or hollow standards 50, in narrow compact clusters as aforesaid, and through the base or bed 29 below the keyboard, and thence to the longitudinally-disposed block 54, the lower portions of said pipes being spread out fan-fashion or distributed horizontally along said block 54 to connect the tracker-bar pipes with the line of pneumatics arranged longitudinally in the lower part of the case. The lower ends of said pipes 13 are cemented or otherwise affixed in ducts or openings in said longitudinal block 54, which block is detachably fastened to the wind-chest 14 and has its several ducts communicating with suitable conduits leading to the respective controlling pneumatics, operation of which under impulses of air admitted through the tracker-bar by the traveling music-sheet actuates the secondary pneumatics 4 which in turn operate the strikers 3 to play the piano mechanically, when the wind-inducing apparatus is worked. It is understood of course that each duct in the tracker-bar is connected by the means described with its corresponding pneumatic in the lower part of the case. It will be observed the lower edge of the longitudinal block 54 is above the top of the pneumatic strikers 3, so as to allow the wind-chest to be moved out through the front. Thus by reference to Fig. 3, it is apparent that practically the entire front of the piano-action is exposed, when the front panel of the piano case is removed, so that access for adjusting the instrument and the like can easily be had. It is also observable that the mechanisms in front of the piano-action are arranged in separable elements, the upper one of which comprises the block 48 with the frame 7 and music-sheet mechanism carried thereby and primary pipe lengths 12, while the lower elements comprise the hollow standards 50 and secondary pipe lengths 13. The construction described allows the upper and lower mechanisms of the piano-action to be assembled in or removed from the instrument without interference from the tracker-bar pipes, which are entirely disassociated from the action.

As aforesaid, the casings or hollow standards 50 which contain the two groups of tracker-bar pipes are arranged in the widened spaces occurring between the key-levers to accommodate the action-brackets 27. The key-lever frame (comprising the medial rail or bar 55 on which the key-levers are fulcrumed, and the front and rear rest rails 56 and 57), is arranged to be slid back into place or withdrawn, together with the series of key-levers mounted thereon, without obstruction by reason of the casings or hollow standards 50 arranged to extend through the keyboard. To this end, the rear bar 57 of the key-lever frame is broken away at 58, providing spaces wider than the hollow standards 50 and the action-brackets 27, and dividing the rear bar 57 into three lengths, which are connected with the bars 55 and 56 by the cross-bars 59. Thus the entire structure and arrangement of the organized mechanisms of the instrument are such as to facilitate the initial construction and assemblage of parts, and permit removal of the different mechanisms without derangement thereof or without necessitating the dismantling of the entire instrument or derangement of other mechanisms; the key-levers and their supporting frame, the two mechanisms of the piano-action proper, the groups of mechanisms comprising the music-sheet mechanism and tracker-bar pipes, and the wind-box, all being correlated but separate and distinct and independently removable.

Having thus fully described my invention,

what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a combined manually and mechanically operated instrument, the combination of a piano-action including a wippen, a key-lever, a rod driving said wippen but not connected thereto and having a lug or projection bearing on the key-lever, said rod being supported thereby, and a mechanical striker arranged for operating on said rod.

2. In a combined manually and mechanically operated instrument, the combination of a piano-action, a key-lever, a mechanical striker, an action-actuating rod not connected to said action vertically disposed behind the rear end of the key-lever having a forward projection supported thereby and having its foot supported by the striker.

3. In a combined manually and mechanically operated instrument, the combination of a piano-action, a key-lever, an action-actuating rod not connected to said action vertically disposed behind the rear end of the key-lever and having means for direct engagement thereby for lifting said rod when the key is depressed, and a mechanical striker adapted to operate on the lower end of said rod and to lift the same.

4. In an automatic instrument, the combination of a pneumatic motor for operating music-winding devices, a rocking cradle supporting said motor and allowing the same to swing bodily, an air pipe arranged substantially coaxial with the axis of said cradle, and a cranked pipe connecting said motor and air pipe.

5. In an autopneumatic instrument, the combination of a note-selective mechanism including its operating shaft, a motor therefor movably supported, an air pipe for said motor and a cradle supporting said motor and fulcrumed coaxially with said shaft and said air pipe, both of which are connected with said motor, whereby the motor can be swung out of operative position without disturbing the operative relation between the same and the said note-selective mechanism.

6. In a combined manually and mechanically operated instrument, the combination of the manual keys, piano-action proper, note-selective mechanism above the keys, a longitudinal series of pneumatics below the keyboard, there being a relatively wide space between two adjacent key-levers, and the pipes connecting the note-selective mechanism and pneumatics, said pipes being carried together from the note-selective mechanism and arranged in a narrow compact cluster passing through said widened space between the key-levers, and thence being spread or distributed to the pneumatics below the the keyboard.

7. In a combined manually and mechanically operated instrument, the combination of the manual keys and piano-action, a tracker-bar above the key-board, and pneumatics below the same, and pneumatic pipes connecting the ducts in the tracker-bar with the pneumatics, said pipes diverging from the tracker-bar in two groups which are carried in compact clusters down through the keyboard and thence to the pneumatics, the key-levers at opposite sides of said groups of pipes being diverging to provide relatively widened spaces.

8. In a combined manually and mechanically operated instrument, the combination of the keyboard and piano-action, there being relatively widened spaces between adjacent key-levers at suitable locations, narrow hollow standards or casings mounted on the bed of the keyboard within said widened spaces, a note-selective mechanism supported by said standards, and pneumatic pipes extending therefrom through said standards, and a series of pneumatics below the keyboard connected with the respective pipes.

9. In a combined manually and mechanically operated instrument, the combination of the keyboard and piano-action, there being relatively widened spaces between adjacent key-levers at suitable locations, narrow hollow standards mounted on the bed of the keyboard in said widened spaces, a block mounted upon said standards, a note-selective mechanism supported by said block, pneumatic pipes extending from the note-selective mechanism to the ends of the block and secured therein, and secondary pipe lengths registering therewith and arranged in said hollow standards and leading below the keyboard, and pneumatics connected to the lower ends of said pipes.

10. In an autopneumatic instrument, the combination with the piano-action and pneumatic playing apparatus, of the key-board bed, upright standards mounted thereon constituting supports for the mechanism of of the autopneumatic instrument, and a key-lever frame arranged to rest on the keyboard and adapted to be pushed back or withdrawn, having recessed or cut-away spaces to accommodate said standards, and a series of key-levers supported on said key-lever frame, the key-levers diverging at opposite sides of the standards.

11. The combination of a piano-action comprising a plurality of elements, the manual keys therefor, a tracker-bar in front of the action, and pipes extending therefrom in two opposite or diverging groups, each group being carried in a narrow compact cluster down through the key-board between adjacent key-levers, the spaces between such key-levers being relatively widened, and a series of pneumatics connected with the lower ends of said pipes.

12. The combination of a piano-action,

key-board, tracker-bar and pneumatics, the key-board being located between said tracker-bar and pneumatics, there being a relatively widened space between two adjacent key-levers, and a gang of pipes passing through the key-board in such widened space and connecting the tracker-bar and pneumatics.

13. The combination of the key-levers and action, there being relatively widened spaces therein at intermediate points, action-brackets in said spaces, a pneumatic-controlling apparatus in front of the action and above the key-board, hollow supports therefor located in said spaces in front of said action-brackets, pneumatics below the key-board, and pipes connecting said apparatus and pneumatics, said pipes being carried through said hollow supports.

14. The combination with the keys and key-board bottom, of a tracker-bar frame, a tracker-bar carried thereby, chambered supports therefor mounted on said bottom, pipes extending from the tracker-bar through said supports and down through said bottom, the key-levers being deflected apart at opposite sides of said supports, and pneumatics connected with said pipes.

15. The combination of the key-levers and action, there being relatively widened spaces therein at intermediate points, action-brackets in such spaces, a pneumatic-controlling apparatus supported in front of the action, and pipes extending therefrom in diverging groups which are carried downwardly in front of the action and through the key-board in such spaces.

16. The combination with the key-board bottom, of a tracker-bar frame, chambered supports therefor mounted on said bottom, and tracker-bar pipes extending through said supports and bottom.

17. The combination with the key-board bottom, of a tracker-bar frame, chambered supports therefor mounted on said bottom, a tracker-bar carried by said frame, primary lengths of tracker-bar pipes extending therefrom, and secondary lengths of pipes arranged in said supports and passing through said bottom, the contiguous ends of said pipe-lengths being detachably connected together.

18. The combination of a music-spool supporting-frame and its bottom board 48 upon which said frame is erected, a tracker-bar carried by said frame, primary lengths of tracker-bar pipes extending therefrom and having their ends secured in ducts or openings in said board 48, and secondary pipe lengths, and a block or blocks provided with ducts in which the ends of said secondary pipe lengths are secured the said block or blocks being secured directly to said board 48 with the ducts thereof in registration.

In testimony whereof I affix my signature, in presence of two witnesses.

JOHN W. DARLEY, Jr.

Witnesses:
A. M. Parkins,
Osgood H. Dowell.