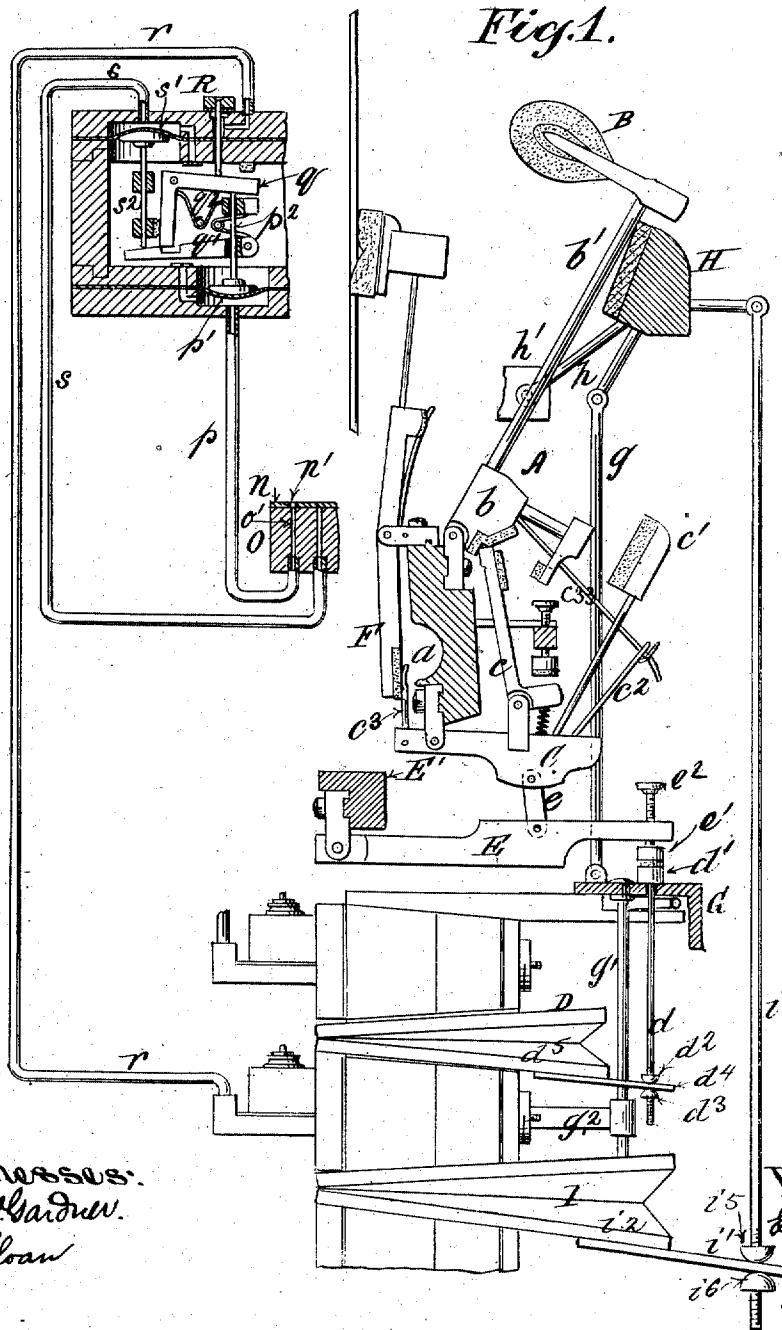


G. P. BRAND.
 AUTOMATIC PIANO PLAYING MECHANISM.
 APPLICATION FILED FEB. 10, 1906.

983,422.

Patented Feb. 7, 1911.

4 SHEETS—SHEET 1.



Witnesses:
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Inventor:
 Geo. P. Brand
 By his Attorney
 Geo. M. Meach

983,422.

4 SHEETS—SHEET 2.

This diagram illustrates a complex mechanical assembly, possibly a type-setting machine or a similar industrial device. The main body features several large, angled plates and levers, with labels such as A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, AA, AB, AC, AD, AE, AF, AG, AH, AI, AJ, AK, AL, AM, AN, AO, AP, AQ, AR, AS, AT, AU, AV, AW, AX, AY, AZ, BA, BB, BC, BD, BE, BF, BG, BH, BI, BJ, BK, BL, BM, BN, BO, BP, BQ, BR, BS, BT, BU, BV, BW, BX, BY, BZ, CA, CB, CC, CD, CE, CF, CG, CH, CI, CJ, CK, CL, CM, CN, CO, CP, CQ, CR, CS, CT, CU, CV, CW, CX, CY, CZ, DA, DB, DC, DD, DE, DF, DG, DH, DI, DJ, DK, DL, DM, DN, DO, DP, DQ, DR, DS, DT, DU, DV, DW, DX, DY, DZ, EA, EB, EC, ED, EE, EF, EG, EH, EI, EJ, EK, EL, EM, EN, EO, EP, EQ, ER, ES, ET, EU, EV, EW, EX, EY, EZ, FA, FB, FC, FD, FE, FF, FG, FH, FI, FJ, FK, FL, FM, FN, FO, FP, FQ, FR, FS, FT, FU, FV, FW, FX, FY, FZ, GA, GB, GC, GD, GE, GF, GG, GH, GI, GJ, GK, GL, GM, GN, GO, GP, GQ, GR, GS, GT, GU, GV, GW, GX, GY, GZ, HA, HB, HC, HD, HE, HF, HG, HH, HI, HJ, HK, HL, HM, HN, HO, HP, HQ, HR, HS, HT, HU, HV, HW, HX, HY, HZ, IA, IB, IC, ID, IE, IF, IG, IH, II, IJ, IK, IL, IM, IN, IO, IP, IQ, IR, IS, IT, IU, IV, IW, IX, IY, IZ, JA, JB, JC, JD, JE, JF, JG, JH, JI, JJ, JK, JL, JM, JN, JO, JP, JQ, JR, JS, JT, JU, JV, JW, JX, JY, JZ, KA, KB, KC, KD, KE, KF, KG, KH, KI, KJ, KK, KL, KM, KN, KO, KP, KQ, KR, KS, KT, KU, KV, KW, KX, KY, KZ, LA, LB, LC, LD, LE, LF, LG, LH, LI, LJ, LK, LL, LM, LN, LO, LP, LQ, LR, LS, LT, LU, LV, LW, LX, LY, LZ, MA, MB, MC, MD, ME, MF, MG, MH, MI, MJ, MK, ML, MM, MN, MO, MP, MQ, MR, MS, MT, MU, MV, MW, MX, MY, MZ, NA, NB, NC, ND, NE, NF, NG, NH, NI, NJ, NK, NL, NM, NN, NO, NP, NQ, NR, NS, NT, NU, NV, NW, NX, NY, NZ, OA, OB, OC, OD, OE, OF, OG, OH, OI, OJ, OK, OL, OM, ON, OO, OP, OQ, OR, OS, OT, OU, OV, OW, OX, OY, OZ, PA, PB, PC, PD, PE, PF, PG, PH, PI, PJ, PK, PL, PM, PN, PO, PP, PQ, PR, PS, PT, PU, PV, PW, PX, PY, PZ, QA, QB, QC, QD, QE, QF, QG, QH, QI, QJ, QK, QL, QM, QN, QO, QP, QQ, QR, QS, QT, QU, QV, QW, QX, QY, QZ, RA, RB, RC, RD, RE, RF, RG, RH, RI, RJ, RK, RL, RM, RN, RO, RP, RQ, RR, RS, RT, RU, RV, RW, RX, RY, RZ, SA, SB, SC, SD, SE, SF, SG, SH, SI, SJ, SK, SL, SM, SN, SO, SP, SQ, SR, SS, ST, SU, SV, SW, SX, SY, SZ, TA, TB, TC, TD, TE, TF, TG, TH, TI, TJ, TK, TL, TM, TN, TO, TP, TQ, TR, TS, TT, TU, TV, TW, TX, TY, TZ, UA, UB, UC, UD, UE, UF, UG, UH, UI, UJ, UK, UL, UM, UN, UO, UP, UQ, UR, US, UT, UU, UV, UW, UX, UY, UZ, VA, VB, VC, VD, VE, VF, VG, VH, VI, VJ, VK, VL, VM, VN, VO, VP, VQ, VR, VS, VT, VU, VV, VW, VX, VY, VZ, WA, WB, WC, WD, WE, WF, WG, WH, WI, WJ, WK, WL, WM, WN, WO, WP, WQ, WR, WS, WT, WU, WV, WW, WX, WY, WZ, XA, XB, XC, XD, XE, XF, XG, XH, XI, XJ, XK, XL, XM, XN, XO, XP, XQ, XR, XS, XT, XU, XV, XW, XX, XY, XZ, YA, YB, YC, YD, YE, YF, YG, YH, YI, YJ, YK, YL, YM, YN, YO, YP, YQ, YR, YS, YT, YU, YV, YW, YX, YY, YZ, ZA, ZB, ZC, ZD, ZE, ZF, ZG, ZH, ZI, ZJ, ZK, ZL, ZM, ZN, ZO, ZP, ZQ, ZR, ZS, ZT, ZU, ZV, ZW, ZX, ZY, ZZ.

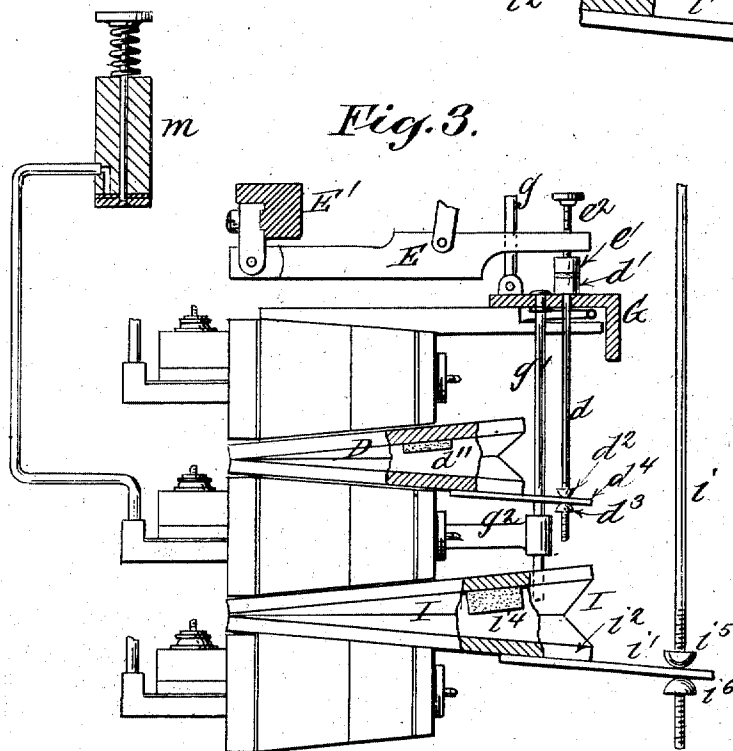
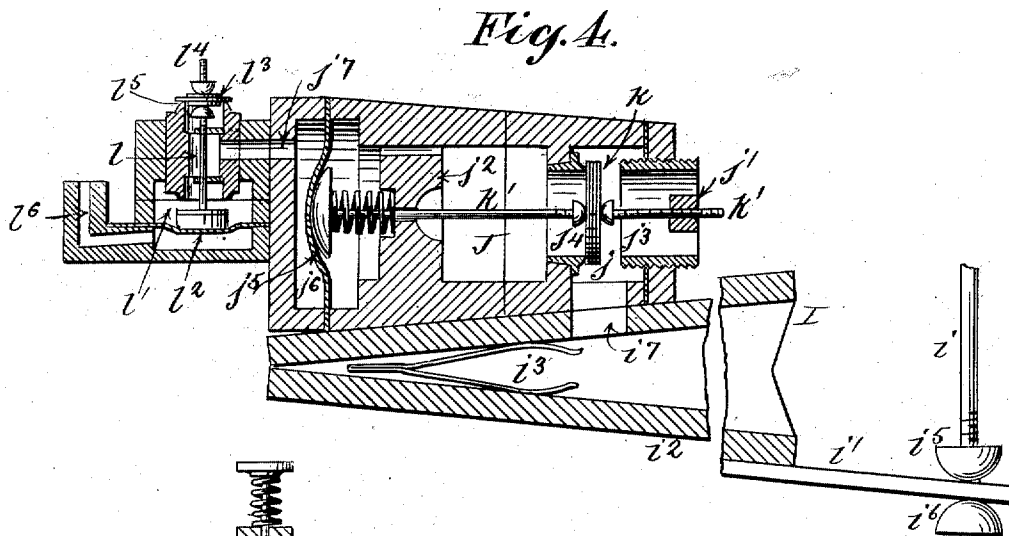
Inventor:
Geo. P. R. and
By his Atty
Geo. W. Mearns

G. P. BRAND.
AUTOMATIC PIANO PLAYING MECHANISM.
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4 SHEETS—SHEET 3.



Witnesses:
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G. P. BRAND.
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4 SHEETS—SHEET 4.

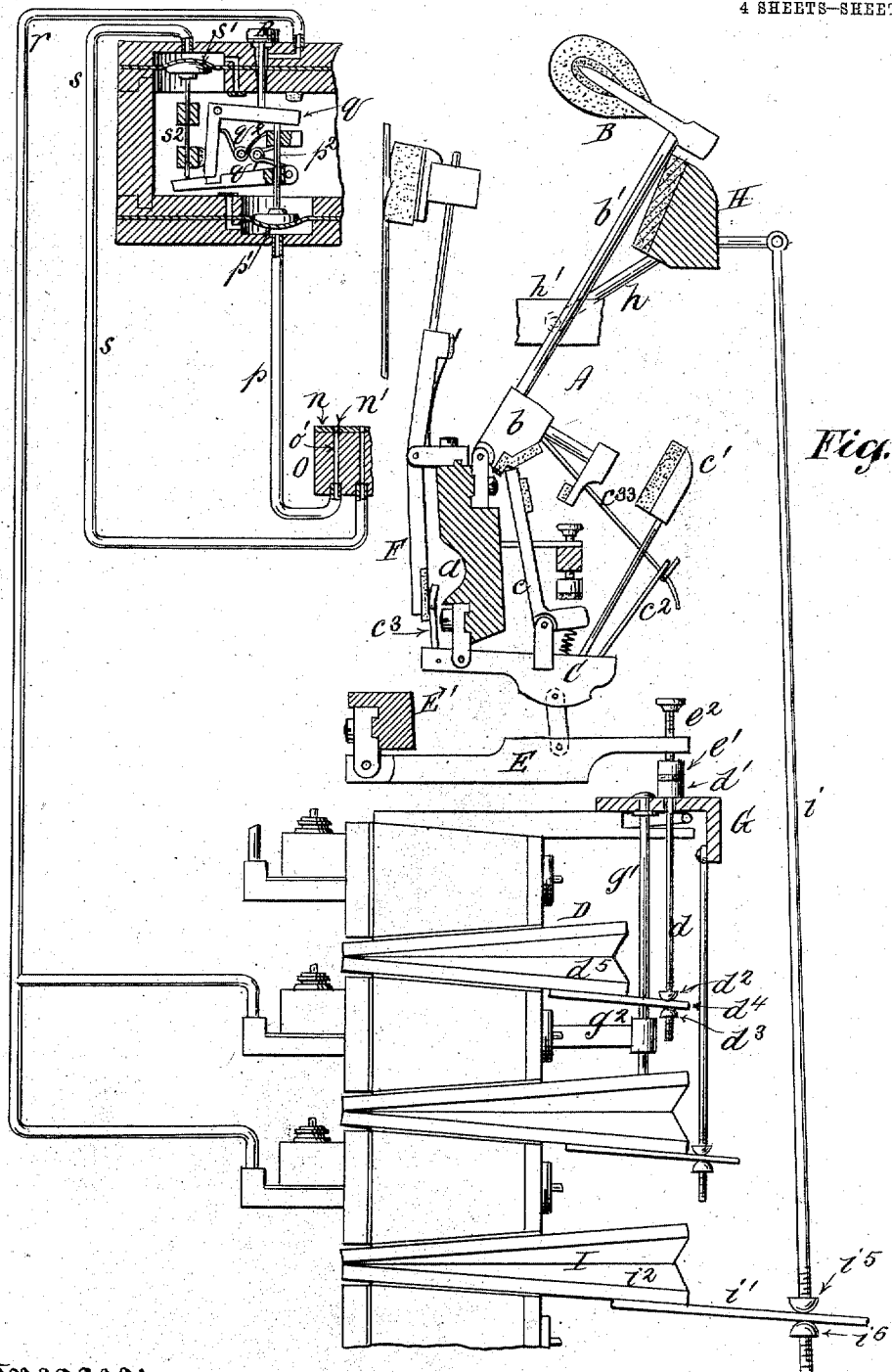


Fig. 5.

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 By *Geo. P. Brand*
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UNITED STATES PATENT OFFICE.

GEORGE P. BRAND, OF NEW YORK, N. Y.

AUTOMATIC PIANO-PLAYING MECHANISM.

983,422.

Specification of Letters Patent.

Patented Feb. 7, 1911.

Application filed February 10, 1906. Serial No. 300,430.

To all whom it may concern:

Be it known that I, GEORGE P. BRAND, a citizen of the United States, residing in the city of New York, borough of Bronx, county and State of New York, have invented certain new and useful Improvements in Automatic Piano-Playing Mechanism, of which the following is a specification.

My improvements relate to automatic piano-playing mechanism in which the parts are actuated and controlled by pneumatic means, the main objects being to attain, automatically or manually, pianissimo effects, and also to obviate, in so far as is possible, frictional contact and lost motion between the parts.

By my improvements I effect simultaneously the shortening of the stroke of both the hammers and their actuating pneumatics in such manner as to insure a quick repetition of the action with a moderate impact against the strings, thereby attaining a speed and delicacy of action and a softness of tone not heretofore attained in automatic piano players.

The invention consists primarily in the use of means for adjusting the hammer rail in position with relation to the strings and at the same time adjusting the stroke of the actuating pneumatics with relation to the piano actions in such manner as to maintain a uniform relation and engagement of parts; and secondarily in certain specific features in the construction and arrangement of parts hereinafter described and claimed.

In illustrating the practical application of my invention in the accompanying drawings, I show means for operating the same through the medium of a tracker bar and connections as well as means for operating the same manually by a finger button, but I do not wish to limit myself in this respect to the identical construction and arrangement of parts nor to any other specific construction, since, in adapting the apparatus to the requirements of special forms of automatic piano players, various changes and mechanical expedients may be resorted to without departing from the spirit and intent of my invention, which involves broadly the restriction of the stroke of the hammers, by the adjustment of the hammer rail, and the simultaneous shortening of the stroke of

the actuating pneumatics to correspond to such change in position of the hammer rail in such manner that the relative positions of the parts are undisturbed, the contact between the jacks and the hammer butts of the actions being maintained during the change, so that there is no lost motion between the parts when the hammer rail is raised.

With this understanding, Figure 1, of the drawings represents in sectional elevation one of a series of piano movements and pneumatic apparatus controlled by a tracker bar, the parts being shown in their normal positions, affording full stroke for actuating pneumatics and the hammers; Fig. 2, is a like view showing the guide rail set to limit the stroke of the actuating pneumatic, and the hammer rail set to limit the throw or movement of the hammers; Fig. 3, is a view illustrating a modification in which a finger button is used in lieu of the tracker bar; Fig. 4, is a section upon an enlarged scale of a form of valve chest which may be used in conjunction with the pneumatics for effecting the adjustment of the guide rail and the hammer rail, as well as for the actuating pneumatics. Fig. 5, is a view similar to Fig. 1, showing a modification in which independent pneumatic means are provided for moving the guide rail and the hammer rail separately but simultaneously.

The piano actions, represented in a general way by the reference letters A, in the drawings, are of any well known or desired construction, *a*, being the stationary action rail upon which the butts *b*, of the hammer shanks *b'*, and hammers B are pivotally supported, said action rail *a*, also affording pivotal support for the wippens C, carrying the jack *c*, back check *c'*, and bridle wire *c''*, and spoon *c'''*, for engagement with the damper lever F,—the main novelty in the present case consisting in the introduction, between each wippen C, and the rod *d* of its actuating pneumatic D, of a multiplying lever E, pivotally supported upon a stationary part E', and pivotally connected with the wippen C by an abstract or link *e*, said lever E carrying an adjustable contact or bearing *e'*, for engagement with the upper end or head *d'*, of the said actuating pneumatic rod *d*.

It will be seen that the multiplying lever E, is of the second order, in that the work is performed between the fulcrum and the end

to which the power is applied, so that the latter will be augmented by the leverage to impart a short, quick powerful movement to the wippen C, when the actuating pneumatic D is deflated, thereby having the advantage of cutting down the size of the pneumatics to go in a smaller space without any loss of power, thus insuring a practically instantaneous blow and retraction of the hammer. Not the least important function of the multiplying lever E, however, consists in the means which it affords for effecting the accurate and delicate adjustment of the relation and connection between the piano action A as a whole, and its actuating pneumatic D, so as to obviate all looseness, lost motion or play, and eliminate, or reduce to the minimum, all sliding, frictional contact of parts, thereby avoiding unnecessary wear and tear. The contact e , may obviously be made adjustable by the use of various mechanical expedients. In the drawings, it is shown as rigidly attached to the end of an adjusting screw e^2 , passing through the free end of the multiplying lever E, so that by turning said screw e^2 , more or less, in one direction or the other, the position of the wippen C, and connections may be regulated with accuracy with relation to the point of support afforded by the head d' , of the thrust rod d , of the actuating pneumatic D. In effecting this relative adjustment of the parts, I prefer to use a taut bridle strap e^1 , as shown in Fig. 1, to insure the instantaneous return of the hammer shank b' , to the hammer rail H, after the full or normal stroke of the hammer.

Each actuating pneumatic rod d , passes through a guide rail G, which except when the pneumatic D is deflated, supports the head d' , and hence also the multiplying lever E wippen C and connections when the action is at rest. Each pneumatic D is provided with an internal stop or punching d'' , for limiting its extent of deflation. The lower end of each pneumatic thrust rod d , is threaded and carries two adjusting nuts d^2 , d^3 , which engage with the arm or extension d^4 , on the movable member d^5 , of each actuating pneumatic D. Thus the extent to which the latter may be inflated when the parts are in their normal positions as shown in Fig. 1, is set primarily by the nuts d^2 , d^3 . It is obvious that if under these conditions, the guide rail G, be raised slightly the extent to which each actuating pneumatic D, may be inflated will be decreased to the extent to which the said guide rail G is raised, thereby shortening the thrust of the pneumatic rod d , and at the same time causing the multiplying lever E to raise the wippen C and connections, so as to follow the hammer butt as the hammer is raised by the rail H, to bring the hammer nearer, and this is accomplished without tripping the jack c .

At the same time the spoon c^3 , rocks the damper lever F, and removes the damper from the string, as illustrated in Fig. 2, in which position the action is adapted to the requirements of pianissimo playing. The guide rail G is thus raised from the primary position shown in Fig. 1, to the secondary position shown in Fig. 2, by means of one or more (preferably two) pneumatics I of suitable size, connected either directly (not shown) or indirectly with said guide rail G. Thus in the arrangement shown in the drawings the guide rail G is connected indirectly with the pneumatic I through the medium of the hammer rail H and connections, said hammer rail H and guide rail G moving in unison, so that the hammer rail H, will support the hammer shank b' , when the latter is retracted, whether the parts are in the primary position shown in Fig. 1 or in the secondary position shown in Fig. 2.

The hammer rail H may be moved independently by pneumatic means, if preferred, synchronously with the movement of the guide rail. That is to say, the stroke of the hammers may be restricted by the use of pneumatic means for moving the hammer rail H in conjunction with pneumatic means for moving the guide rail G provided both rails are moved simultaneously, whether each is moved by independent means, as in the modification illustrated in Fig. 5 or whether both are coupled together and moved in unison by the same pneumatic means as shown in the other figures of the accompanying drawings. In the latter, the hammer rail H is supported upon one or more arms h , (preferably by such an arm at either extremity of the rail H) pivotally secured to a stationary part or parts h' , and is coupled to guide rail G, by one or more connecting rods g , the alinement of the guide rail G, being maintained by one or more guide rods g' , rigidly secured to said guide rail G and sliding in a suitable rigid bearing or bearings g^2 . The hammer rail H is connected by means of the pitman i , with the extension or arm i' , upon the movable member i^2 , of the pneumatic I, and this pneumatic and connection for the support and movement of the hammer rail H may obviously be duplicated, so that I confine myself therein simply to the description of one such pneumatic and connections.

The pneumatic I, is collapsed against the resistance of an internal spring i^3 , which also assists in expanding the pneumatic when communication with the tension chamber J, is closed.

i^4 , is a punching or stop which limits the inward deflation, thus gaging the upward thrust of the pitman i .

The lower end of the pitman i , is threaded to receive the nuts i^5 , i^6 , for engagement with the arm or extension i' , of the movable

member i^2 , of pneumatic I. By this means provision is made for regulating and adjusting the normal position of the movable member i^2 , with relation to the punching i^4 , so as to increase or diminish the thrust of the pitman i , and consequently the extent of movement of the hammer rail H with relation to the strings.

The valve chest work for operating the pneumatic I, and the actuating pneumatics D, may be of any known or desired construction. I have herein by way of illustration only, shown the use of chest work like unto that described and claimed in my concurrent application No. 246,864 filed Feby. 23, 1905, although I do not restrict myself thereto. When this combination of parts is used, the port i^7 , of the pneumatic I, opens directly into the valve chamber j , in which is situated the valve k , mounted upon the rod k' , which is supported in guides j' , j^2 . The valve chamber j , has two seats, one j^3 , opening into the atmosphere, the other j^4 , opening into the tension chamber J. The position of the valve k , is controlled by the diaphragm j^5 , situated in the secondary diaphragm chamber j^6 , which communicates through the port j^7 , and passage l , with the primary chamber l' , in which is situated the diaphragm l^2 , controlling the action of the valve l^3 , upon the rod l^4 , said valve l^3 , resting normally upon the seat l^5 , at the upper end of the passage l , so as to exclude the atmosphere from the passage j^7 , and l , and from diaphragm chambers j^6 , and l' . When air is admitted to the underside of the diaphragm l^2 through the duct l^6 , the valve l^3 , is lifted from its seat l^5 , so that atmospheric pressure, acting upon the diaphragm j^5 , will transfer the valve k , to the seat j^3 , thereby putting the interior of the pneumatic I, in communication with the tension chamber J, and causing the deflation or collapse of said pneumatic I, against the resistance of its internal spring i^3 . As a result, the arm or extension i' , of the movable member i^2 , of the pneumatic I, raises the pitman i , thereby rocking the hammer rail upward upon its pivotal support, and simultaneously raising the guide rail G through the medium of the connecting rod g , the parts assuming and maintaining the relative positions illustrated in Fig. 2, in which the stroke of the hammers is restricted to afford a "soft pedal" effect, or to quicken the action—the partial deflation of the actuating pneumatics D caused by the raising of the guide rail G, keeping the jacks e , in touch with the hammer butts and maintaining essentially the same relation of parts as that which exists in the normal position, so that upon further deflation each actuating pneumatic D, effects the stroke of the hammer instantaneously, without loss of time or motion, and the recovery being just as prompt, it is obvious that the

intervals between blows may be reduced to the minimum,—a consideration of practical importance in automatic piano players, actuated by a perforated music sheet and tracker bar. By providing for the shortening of the stroke of the actuating or hammer pneumatics I am also enabled to attain a quicker repetition of the action with a softer blow of the hammer against the strings,—delicacy of action combined with quick repetition being a desirable feature in automatic players, and one not heretofore satisfactorily attained.

Air may be admitted through the duct l^6 , to the underside of the primary diaphragm l^2 , to effect the deflation of the pneumatic I, to restrict the stroke of the hammers as hereinbefore set forth, either by means of a button valve m , shown in Fig. 3, and which may be depressed manually, or by perforations in the music sheet n , passing over the tracker bar O. In the first case the valve m , is held open as long as the pianissimo or prestissimo effect is desired, the release of the valve m , shutting off the atmospheric pressure from the underside of the primary diaphragm, so that the parts return to their normal positions, it being understood that the usual "bleed" holes are formed in the diaphragms. In the other case in which the restriction of the stroke of the hammers is effected by perforations in the music sheet n , I prefer to interpose between the tracker bar O, and the duct l^6 of the primary diaphragm chamber l' , the controlling mechanism set forth in my concurrent application No. 296,313 filed January 16th 1906, and shown in this connection in Figs. 1 and 2, for the purpose of maintaining the pianissimo or prestissimo effect for a definite period prescribed by the distance on the music sheet between the setting and releasing holes. Thus in Fig. 1, the perforations n' , in the music sheet n , admit air through the hole o' , in the tracker bar O, and through the duct p , to the underside of the diaphragm p' , thereby causing the rod p^2 , to raise the controller lever q , in which position it is locked by the spring latch q' . As a consequence the valve R is raised, admitting air through the duct r , to the underside of the primary diaphragm l^2 , (Fig. 4) and thereby deflating the pneumatic I, and restricting the stroke of the hammers as hereinbefore set forth, and this condition of affairs will be maintained until, as shown in Fig. 2, a second perforation n^2 , in the music sheet n , admits air through the hole o^2 in the tracker bar O, and through the duct s , to the upper side of the diaphragm s' , thereby depressing the latch q' , through the medium of the rod s^2 , and releasing the controlling lever q , which is returned by its spring q^2 , to its normal position and allowing the valve R to close. The closing of the valve R, relieves

the primary diaphragm l^2 , of atmospheric pressure, and the pneumatic I, is again inflated and the parts returned to the position shown in Fig. 1, as hereinbefore described.

- 5 The construction and arrangement is such that the parts are accessible for regulation and adjustment from the front of the player, which is a practical advantage in both the manufacture and the subsequent use of the apparatus. The adjustment of the contacts c , on the multiplying levers E is of special importance in that it provides for the accurate and delicate regulation and support of each piano action as related to the thrust rod of its actuating pneumatic, so as to avoid looseness or play and unnecessary frictional contact. In this connection, also, may be noted the importance of the adjustment of the movable members of the pneumatics upon their thrust rods and with relation to the punchings or stops upon the stationary members of the pneumatics for the purpose of regulating the normal stroke of the rods with accuracy to the requirements of the case.
- 25 What I claim as my invention and desire to secure by Letters Patent is,
1. In an automatic piano player, the combination of a plurality of piano actions, pneumatics for actuating the same, a hammer rail common to all the actions, and means for adjusting the hammer rail in position with relation to the strings and simultaneously adjusting the stroke of the actuating pneumatics with relation to the piano actions, for the purpose described.
- 35 2. In an automatic piano player, the combination of a plurality of piano actions, pneumatics for actuating the same, a hammer rail common to all the actions, and automatic means for simultaneously adjusting the hammer rail in position with relation to the strings and the stroke of the actuating pneumatics with relation to the piano actions, for the purpose described.
- 45 3. In an automatic piano player, the combination of a plurality of piano actions, pneumatics for actuating the same, a hammer rail common to all the actions, and pneumatic means for automatically and simultaneously adjusting the hammer rail in position with relation to the strings and the stroke of the actuating pneumatics with relation to the piano actions, for the purpose described.
- 55 4. In an automatic piano player the combination of a plurality of piano actions, pneumatics for actuating the same, a hammer rail common to all the actions, a guide rail supporting the thrust rods of said actuating pneumatics, said thrust rods, and means for simultaneously raising and lowering the hammer rail and said guide rail, for the purpose described.
- 60 5. In an automatic piano player, the combination of a plurality of piano actions,

pneumatics for actuating the same, a hammer rail common to all the actions, a guide rail supporting the thrust rods of said actuating pneumatics, said thrust rods, and pneumatic means for simultaneously raising and lowering the hammer rail and said guide rail, for the purpose described.

6. In an automatic piano player, the combination of the hammer rail, piano actions and pneumatics for actuating the same, thrust rods on said actuating pneumatics formed with heads adapted to rest upon a guide rod, said guide rod, and means for simultaneously raising and lowering said hammer rail and said guide rail, for the purpose described.

7. In an automatic piano player, the combination of the hammer rail, piano actions and pneumatics for actuating the same, thrust rods on said actuating pneumatics formed with heads adapted to rest upon a guide rod, said guide rod, and pneumatic means for simultaneously raising and lowering said hammer rail and said guide rail, for the purpose described.

8. In an automatic piano player, the combination of the piano actions and pneumatics for actuating the same, thrust rods on said actuating pneumatics formed with heads adapted to rest upon a guide rail, said guide rail, means for raising and lowering the said guide rail, a hammer rail and means for simultaneously varying the position of the hammer rail with relation to the strings, for the purpose described.

9. In an automatic piano player, the combination of the piano actions and pneumatics for actuating the same, thrust rods on said actuating pneumatics formed with heads adapted to rest upon a guide rail, said guide rail, pneumatic means for raising and lowering the said guide rail, a hammer rail and pneumatic means for simultaneously varying the position of the hammer rail with relation to the strings, for the purpose described.

10. In an automatic piano player, the combination of the piano actions and pneumatics for actuating the same, a guide rail, a pivotally supported hammer rail, thrust rods on said actuating pneumatics formed with heads adapted to rest upon a guide rail, said guide rail, means for supporting said guide rail upon and suspending it from said hammer rail, and means connected with said pivotally supported hammer rail and arranged to vary the position of the latter with relation to the strings and to simultaneously change the position of the said guide rail, for the purpose described.

11. In an automatic piano player, the combination of the piano actions and pneumatics for actuating the same, thrust rods on said actuating pneumatics formed with heads adapted to rest upon a guide rail, said guide rail, means for supporting said guide rail

upon and suspending it from a pivotally supported hammer rail, said hammer rail, and pneumatic means connected with said pivotally supported hammer rail and arranged
5 to vary the position of the latter with relation to the strings and to simultaneously change the position of the said guide rail, for the purpose described.

12. In an automatic piano player, the combination of a piano action and pneumatic for actuating the same by means of a thrust rod, said thrust rod, a punching or stop arranged within the pneumatic to limit the extent of deflation of said pneumatic, and adjustable
15 means upon the thrust rod of the pneumatic for regulating the extent to which said pneumatic may be inflated, for the purpose described.

13. In a pneumatic piano player, the combination of a piano player action and pneumatic for actuating the same by means of a thrust rod, said thrust rod, a head or lateral shoulder on said thrust rod for engagement with a guide rail, and adjustable means upon
20 said thrust rod for regulating the extent of movement of the movable member of the pneumatic when the shoulder or head on the thrust rod is in engagement with the guide rail together with said guide rail, for the
30 purpose described.

14. In a pneumatic piano player, the combination of a piano action and pneumatic for actuating the same by means of a thrust rod, said thrust rod, a head or lateral shoulder on said thrust rod for engagement with
35 a guide rail, said guide rail, pneumatic means for raising and lowering the guide rail, and adjustable means upon said thrust rod for regulating the extent of movement
40 of the movable member of the pneumatic when the shoulder or head of the thrust rod is in engagement with the guide rail, for the purpose described.

15. In a pneumatic player, the combination of a plurality of piano actions and pneumatics for actuating the same by means of thrust rods, said thrust rods, lateral projections on said thrust rods for engagement
45 with said guide rail, said guide rail, means for raising and lowering said guide rail, and means for varying and regulating the extent of motion of said guide rail, for the purpose described.

16. In an automatic piano, the combination of a piano action and a pneumatic for actuating the same, a thrust rod connected with the pneumatic, a pivoted lever interposed between the thrust rod and the wippen of said action, and a link pivoted at its
55 ends to said lever and wippen and positively connecting said parts together, a guide rail, connections between the same and the pneumatics, a hammer rail, and connections whereby both rails are simultaneously
65 moved.

17. In an automatic piano, the combination of a piano action and a pneumatic for actuating the same, a thrust rod connected with the pneumatic, a pivoted lever interposed between the thrust rod and the wippen of said action, a link pivoted at its ends to said lever and wippen and positively connecting said parts together, and an adjustable contact on said lever for engagement with said thrust rod, a guide rail, connections between the same and the pneumatics, a hammer rail, and connections whereby
75 both rails are simultaneously moved.

18. In an automatic piano, the combination of a piano action and a pneumatic for actuating the same, a thrust rod connected with the pneumatic, a pivoted lever interposed between the thrust rod and the wippen of said action, a link pivoted at its ends to said lever and wippen and positively connecting said parts together, and an adjustable contact on said lever for engagement with said thrust rod, said link being disposed between the fulcrum of the lever and the thrust rod; a guide rail, connections between the same and the pneumatics, a hammer rail, and connections whereby both rails
85 are simultaneously moved.

19. In an automatic piano, the combination of a piano action and a pneumatic for actuating the same, a thrust rod connected with the pneumatic, a pivoted lever interposed between the thrust rod and the wippen of said action, a link pivoted at its ends to said lever and wippen and positively connecting said parts together, and an adjustable contact on said lever for engagement with said thrust rod, a guide rail, connections between the same and the pneumatics, a hammer rail, and connections whereby
100 both rails are simultaneously moved.

20. In a pneumatic player, the combination of a plurality of piano actions and pneumatics for actuating the same by means of thrust rods, said thrust rods, lateral projections on said thrust rods for engagement with a guide rail, said guide rail, pneumatic means for raising and lowering said guide rail, and means for varying and regulating the extent of motion of said guide rail, for
115 the purpose described.

21. In a pneumatic player, the combination of a plurality of piano actions and pneumatics for actuating the same by means of thrust rods, said thrust rods, lateral projections on said thrust rods for engagement with a guide rail, said guide rail, a pneumatic and connections for raising and lowering said guide rail, a punching or stop arranged to limit the deflation of said pneumatic, and means for regulating and adjusting the extent of inflation of said pneumatic, for the purpose described.

22. In a pneumatic player, the combination of a plurality of piano actions and
120

- pneumatics for actuating the same by means of thrust rods, said thrust rods, a guide rail, a hammer rail, lateral projections on said thrust rods for engagement with said guide rail, said guide rail suspended upon the hammer rail, a rod or pitman connected with the hammer rail whereby the latter is pivotally supported and connected with a pneumatic, a punching or stop arranged to limit the deflation of said pneumatic and means for regulating and adjusting the extent of inflation of said pneumatic, for the purpose described.
23. In a pneumatic player, the combination of a plurality of piano actions and pneumatics for actuating the same by reason of thrust rods, said thrust rods, lateral projections on said thrust rods for engagement with a guide rail, said guide rail suspended upon the hammer rail, said hammer rail pivotally supported and connected with a pneumatic by a rod or pitman, said pitman formed with a threaded portion, adjusting nuts on said threaded portion for engaging with the movable member of the pneumatic and regulating the extent of inflation thereof, and a punching or stop arranged to limit the deflation of said pneumatic, for the purpose described.
24. The combination of a piano action, a pneumatic action, and means for simultaneously shortening the stroke of the hammers of the piano action and their actuating pneumatics.
25. The combination of a piano action, a pneumatic action for operating the same, and means for simultaneously shortening the striking distance of the hammers of the piano action and the working movement of the pneumatics.
26. The combination of a piano action, a pneumatic action for operating the same, and means for simultaneously shortening the striking distance of the hammers of the piano action and the working movement of the pneumatics and maintaining contact of the jacks and hammer butts of the piano action.
27. The combination of a piano action, a pneumatic action for operating the same, and means for simultaneously shortening the striking distance of the hammers of the piano action and the working movement of the pneumatics and maintaining contact of the jacks and hammer butts of the piano action and of the said action and preventing lost motion.
28. A mechanical musical instrument having sound producing devices, a movable hammer rail, wippens, striking pneumatics and abstracts operated by the pneumatics and actuating the sound producing device, the lower ends of the abstracts being connected with the fingers of the pneumatics, said striking pneumatics having interior cushions or buffers for limiting the exhaustion of said pneumatics, a movable abstract rail or guide, and mechanical means for moving the abstract rail and the movable rail simultaneously.
29. A manually or mechanically operated piano having an action including wippens, and a movable hammer rail, a pneumatic action for operating the piano action said pneumatic action containing a movable abstract rail, or guide, mechanical means for moving the abstract rail and the hammer rail simultaneously, for the purpose specified.
30. A manually or mechanically operated piano having an action including wippens and a movable hammer rail or rest, striking pneumatics and abstracts operated by the pneumatics and actuating the piano action, said abstracts having stops combined with a movable guide rail.
31. A manually or mechanically operated piano having an action with wippens, pneumatic strikers having fingers, and abstracts for operating said wippens, the abstracts having stops which rest upon a movable guide rail, the movable guide rail, the lower ends of the abstracts being connected with the pneumatic fingers.
32. In a piano, a suitable piano action, playing mechanism consisting of pneumatics and means for actuating the same, push rods for said pneumatics actuatingly engaging said piano action, a movable push rod rail to raise said push rods and means for moving said push rod rail.
33. In a piano, the combination with the striking pneumatics and hammers, of means for simultaneously partially collapsing all of the striking pneumatics before they are operated to move the hammers to soften the striking blows of the hammers.
34. In a piano player, the combination with hammers and accessories, an adjustable hammer rest and means for adjusting the hammer rest, of striker pneumatics, means for operating the hammers from the striker pneumatics, and means for adjusting the striker pneumatics correspondingly with the hammer rest, substantially as set forth.
35. In a player piano, the combination with hammers and accessories, an adjustable hammer rest and means for adjusting the hammer rest, of striker pneumatics, means for operating the hammers from the striker pneumatics, and means for reducing the stroke of the striker pneumatics simultaneously with the adjustment of the hammer rest, substantially as set forth.
36. In a player piano, the combination with hammers and accessories, an adjustable hammer rest and means for adjusting the hammer rest, of striker pneumatics, means for operating the hammers from the striker pneumatics, and means for adjusting the

striker pneumatics by the same means that serve for adjusting the hammer rest, substantially as set forth.

37. In a player piano, the combination
5 with hammers and accessories, an adjustable hammer rest and means for operating the hammer rest, of striker pneumatics, means for operating the hammers from the striker
10 pneumatics, and means for reducing the stroke of the striker pneumatics by the same means that adjust the hammer rest, substantially as set forth.

38. In a player piano, the combination
15 with hammers and accessories, and an adjustable hammer rest, of a rod for the shifting of the hammer rest, striker pneumatics, means for operating the hammers from the striker pneumatics and means operated by
20 said rod for adjusting the striker pneumatics, substantially as set forth.

39. In a player piano, the combination
25 with hammers and accessories, and an adjustable hammer rest, of a rod for adjusting

the hammer rest, striker pneumatics, operating means extending from the striker pneumatics to the hammer operating devices, an
30 adjustable device for lifting said means, and mechanism for operating said lifting device simultaneously with adjusting the hammer rest adjusting means, substantially as set forth.

40. In a player piano, the combination
35 with hammers and accessories, and an adjustable hammer rest, of a rod for adjusting the hammer rest, striker pneumatics, rods extending from the striker pneumatics to the hammer operating devices, an adjustable
40 means for lifting said rods, through which said rods pass freely and mechanism for operating said lifting device simultaneously with the hammer rest adjusting means, substantially as set forth.

GEORGE P. BRAND.

Witnesses:

GEO. WM. MIATT,
D. W. GARDNER.